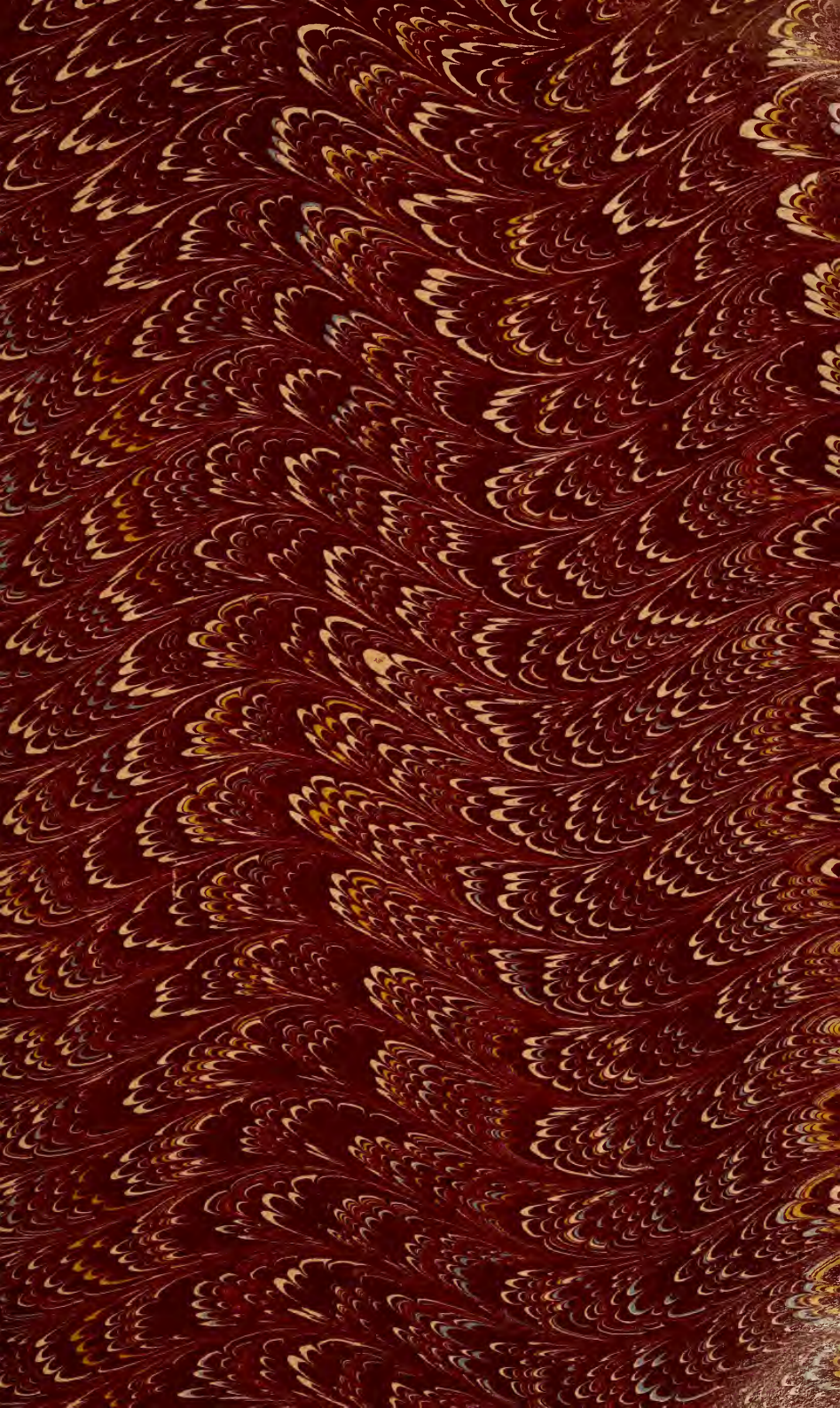






Library



6. (19.4)

1/2 def

5040



N. Y. ACADEMY
OF SCIENCES

Series
B 866

BULLETIN
OF THE
CALIFORNIA
ACADEMY OF SCIENCES.

VOLUME II.

(Nos. 5-8.)

1886-1887.

SAN FRANCISCO:
1887.

TABLE OF CONTENTS.

	PAGE.
Becker, George F. The Washoe Rocks.....	93
Bryant, Walter E. Additions to the Ornithology of Guadalupe Island. 269	269
Nest and Eggs of the Evening Grosbeak	449
A New Subspecies of Petrel from Guadalupe Island.....	450
Unusual Nesting Sites. I.....	451
Casey, Thomas L. Revision of the California Species of Lithocharis and Allied Genera.....	1
Descriptive Notices of North American Coleoptera. I, Plate 7..	157
On some New North American Pselaphidæ. Plate 16.....	455
Comstock, George C. Provisional Value of the Latitude of the Lick Observatory.....	121
Cooper, J. G. West Coast Pulmonata; Fossil and Living. 1 Map..355,	497
Corrections to Fossil and Sub-Fossil Land Shells in Vol. I....	376
Curran, Mary K. Priority of Dr. Kellogg's Genus <i>Marah</i> over <i>Megar-</i> <i>rhiza</i> Torr.....	521
Davidson, George. Notes on Saturn. Plate 1.....	73
Transits of the II and III Satellites of Jupiter	89
The Annular Solar Eclipse of March 5, 1886.....	91
Submarine Valleys on the Pacific Coast of the United States....	265
Standard Geodetic Data.....	319
Early Spanish Voyages of Discovery on the Coast of California. 325	325
Occultations of Stars by the Dark Limb of the Moon	448
Emerson, W. Otto. Ornithological Observations in San Diego County	419
Glassford, W. A. Weather Types on the Pacific Coast. Plates 2, 3, 4, 5.	77
Greene, E. L. Studies in the Botany of California and Parts Adjacent.	
IV—	
1. On some Cichoriaceæus Compositæ.....	41
2. Some Species of <i>Euphorbia</i> § <i>Anisophyllum</i>	56
3. New Polypetake.....	59
Studies in the Botany of California and Parts Adjacent. V—	
1. Some Genera Which have been Confused Under the Name <i>Brodiaea</i>	125
2. Miscellaneous Species, New or Noteworthy. Plate 6...	144
Studies in the Botany of California and Parts Adjacent. VI...	377

Harkness, H. W. Fungi of the Pacific Coast. V.....	437
Le Conte, Joseph. The Flora of the Coast Islands of California in Relation to Recent Changes of Physical Geography.....	515
Parry, C. C. The Pacific Coast Alders	351
Californian Manzanitas.....	483
Richter, C. Max. Ocean Currents Contiguous to the Coast of Califor- nia. Plates 8, 9, 10, 11, 12, 13, 14, 15....	337
Rivers, J. J. A New Species of Californian Coleoptera, with four figures	61
Contributions to the Larval History of Pacific Coast Coleoptera	64
Smith, Rosa. On Tetraodon Setosus, a New Species Allied to Tetraodon Meleagris Lacép.....	155
Wolle, Francis. Desmids of the Pacific Coast.....	432
Index	525

BULLETIN

OF THE

CALIFORNIA

ACADEMY OF SCIENCES.

Vol. 2, No. 5.

SEPTEMBER, 1886.

CONTENTS.

	PAGE.
Revision of the California Species of Lithocharis and Allied Genera.	
Thos. L. Casey.....	1
Studies in the Botany of California and Parts Adjacent. IV. Edward Lee Greene—	
1. On Some Chicoriaceous Compositæ.....	41
2. Some Species of Euphorbia & Anisophyllum.....	56
3. New Polypetalæ.....	59
A New Species of Californian Coleoptera. J. J. Rivers.....	61
Contributions to the Larval History of Pacific Coast Coleoptera.	
J. J. Rivers.....	64
Notes on Saturn. Geo. Davidson.....	73
Weather Types on the Pacific Coast. W. A. Glassford....	77
Transits of the II and III Satellites of Jupiter. Geo. Davidson.....	89
The Annular Solar Eclipse of March 5, 1836. Geo. Davidson.....	91

ISSUED SEPTEMBER 3d, 1886.

Sam 72

BULLETIN.

No. 5.



California Academy of Sciences.

Revision of the Californian Species of **LITHOCHARIS** and Allied Genera.

BY THOS. L. CASEY.

Read Jan. 4th, 1886.

The species assignable to *Lithocharis* and allied genera are extremely abundant in California and are also very numerous individually, so that a review of the forms occurring here, although not so desirable as a general revision of the North American species, is, at the same time, amply sufficient to form a systematic basis upon which to found such an extended work, and probably loses little of what importance it may possess from the omission of species occurring east of the Rocky Mountains, as these are comparatively few in number and not as yet sufficiently collected.

Belonging to the region here considered, there are described below twenty-five species, most of which are rather local in habitat, although a few have an extended range. In regard to their favorite haunts, little is to be said; they frequent the margins of ponds and water-courses, and are found amongst decaying vegetable matter, roots of grasses, etc., in stony localities, although more abundant in the deep ravines so characteristic of the Coast Mountains. I have occasionally found particular spots of very limited extent in

these ravines, where they exist in enormous profusion, not only individually, but in species indiscriminately mingled; such for instance was a small area of precipitous rocks covered with mould, moss and thin grass, in the deep ravine at Gilroy Springs, Santa Clara County, where a small trickling stream from one of the sulphurous soda-springs enters the creek below. Here I obtained hundreds of specimens of seven distinct species; associated with them were an equal multitude of *Steni* represented by several species. This concentration of insect life, which is one of the peculiarities of faunal distribution in the Pacific regions, is to be accounted for in a measure by the nature of the climate, the long hot summers drying and baking the surface of the ground, and driving all species, except the comparatively few especially constituted to withstand such conditions, to the moist and secluded localities above mentioned.

The study and proper classification of these varied forms is a matter of considerable, although by no means of insuperable difficulty, there being one important characteristic, which is of very great aid to the investigator; this is the facility with which they may be resolved into perfectly definite, and so far as the material collected will allow of judgment—abruptly limited generic subdivisions. The principal difficulty, therefore, consists in the proper differentiation of the species composing these groups, and which are often very closely allied; but even here the difficulty is partially superficial, as when these closely allied forms are separated and carefully studied, they are found to possess very little variability, and the individuals of the several species appear to be unusually uniform throughout extended series.

The genera here considered possess certain characters in common, among which may be mentioned the rather slender maxillary palpi with the third joint very moderately swollen and the fourth minute, subulate and oblique, but distinctly visible; the antennæ also are singularly uniform in structure throughout, being slender—or very slightly ro-

bust in *Metaxyodonta*—and scarcely perceptibly incrassate. The fifth abdominal segment is almost invariably equal in length to the third and fourth together. The labrum differs throughout, and is, in conjunction with the relative length of the first joint of the posterior tarsi, made the principal basis of generic subdivision. It is singular, however, and a strong proof of the validity of the genera, that these two fundamental characters are accompanied by other very radical differences in many of the most important parts of the body, as well as in completely radical differences in the nature of the male sexual modifications; these are described in the table of genera given below.

The genera *Stilicus*, *Scopæus*, *Orus*, etc., should precede those here given in a systematic arrangement of the *Pæderi*, and are distinguished from them by their very strongly dilated third maxillary palpal joint.

San Francisco, Jan. 1st, 1886.

NOTE 1.—In estimating the order of the abdominal segments in the following pages, the numbers refer to visible segments only.

NOTE 2.—Separate diagnoses of the various species are not given at present, as this paper is simply intended as the forerunner of a more general one upon our *Pæderini*.

GENERIC DEFINITIONS.

Head slightly narrower than the prothorax, sides parallel; eyes moderate in size; labrum 4-dentate, the teeth being rather prominent, acute and nearly equi-distant. Prothorax quadrate; sides parallel or very slightly narrowed from apex to base. Elytra much longer than the prothorax. First joint of the posterior tarsi as long as the next two together, or nearly so. Male sexual characters very simple; fifth segment not modified, sixth narrow, with a small simple sinuation at the apex..... Genus **Caloderma**.

Pronotum longitudinally rugulose..... Species 1 — 3.

Pronotum finely and generally very densely punctate.... Species 4 — 8.

Head rather large, slightly wider than the prothorax; eyes very small; labrum with a very small deep median emargination, slightly wider than deep, immediately adjoining which there are on each side two approximate and exceedingly minute acute teeth. Prothorax with the sides convergent pos-

teriorly. Elytra equal in length to the pronotum. First joint of the posterior tarsi fully as long as the next two together. Male sexual characters very simple; fifth segment not modified, sixth narrow with a very small triangular emargination at the apex (bilobed)..... Genus **Oligopterus**.
Species 9.

Head large, distinctly longer and slightly wider than the prothorax, sub-triangular, very minutely punctate; eyes extremely small, round, on the sides before the middle; labrum with two short, or long and slender acute teeth, the edge adjoining them exteriorly being minutely and abruptly sinuate, and between them narrowly and rather deeply emarginate. Prothorax quadrate or slightly wider than long; sides moderately convergent posteriorly. Elytra as long as or very slightly longer than the pronotum. First joint of the posterior tarsi much shorter than the next two together. Male sexual characters rather simple; fifth segment very slightly modified, sixth deeply and evenly sinuate.....Genus **Lithocharis**, Group **A**.
Species 10 — 13.

Head variable, as wide as or slightly wider than the prothorax, sides parallel, punctuation variable; eyes moderate in size; labrum with two small acute triangular teeth, the edge adjoining them exteriorly being minutely sinuate, and between them rather deeply emarginate. Prothorax finely and sparsely punctate with a rather broad median impunctate area; sides parallel or very feebly convergent posteriorly. Elytra much longer than the pronotum. First joint of the posterior tarsi generally but slightly longer than the second. Male sexual modification of the fifth segment very complex, the sixth being rather deeply and roundly emarginate.

Genus **Lithocharis**, Group **B**.

Prothorax not longer than wide.

Posterior angles of the head moderately broadly or rather narrowly rounded.

Head finely and densely punctate..... Species 14

Head much more sparsely punctate.

Sides of pronotum distinctly convergent posteriorly..... Species 15

Sides of pronotum parallel or extremely feebly con-

vergent posteriorly..... Species 16 — 19

Posterior angles of the head very broadly rounded..... Species 20

Prothorax distinctly longer than wide..... Species 21 — 23

Head rather small, sub-triangular, very minutely alutaceous; eyes very large, coarsely granulate; labrum rather large, truncate at apex, rounded and narrowly explanate at the sides, broadly and very feebly sinuate in the middle, and having a single short, very small, acute median tooth which is slightly dorsal. Prothorax scarcely as long as wide; sides nearly parallel. Elytra very slightly longer than wide, distinctly longer than the prothorax. First joint of the posterior tarsi, much shorter than the next two together. Male sexual modification of the fifth segment simple, of the sixth complex.

Genus **Metaxyodonta**.

Species 24 — 25

CALODERMA n. gen.

The species of this genus present a singularly homogeneous appearance, they being distinguished by their very narrow elongate form, small heads with parallel sides, quadrate prothorax and long narrow parallel elytra; the abdominal sculpture is also a distinguishing feature, the transverse wavy lines of minute sub-asperate punctures being peculiar to them, although having a tendency to reappear in the genus *Metaxyodonta*.

1—*C. rugosum* n. sp.—Slender, moderately convex; sides parallel; color throughout piceous; pubescence extremely sparse and scarcely noticeable upon the head and prothorax, very fine, extremely dense and sericeous on the elytra and abdomen, pale ochreous in color and very conspicuous; under surface and legs piceous-brown, the latter slightly paler, tarsi pale brown; antennæ fuscous throughout. *Head* short and robust, scarcely longer than wide; sides parallel, very feebly arcuate; base transversely truncate, basal angles distinctly rounded; surface feebly and evenly convex, finely and extremely densely punctate throughout, slightly more sparsely so between the antennæ; punctures round, shallow and sub-annular; eyes at much more than their own length from the basal angles, moderately prominent; antennæ slender, nearly as long as the head and prothorax together, scarcely perceptibly incrassate; basal joint as long as the next two together, second very slightly shorter and more robust than the third, tenth slightly longer than wide; maxillary palpi piceous-black; labrum with four equal acute triangular teeth, sides broadly and roundly lobed. *Prothorax* about as long as and slightly wider than the head; sides parallel and feebly arcuate; base strongly arcuate; apex broadly and much less strongly so; apical angles distinctly rounded, basal very broadly so; apex with a very small feeble sinuation in the middle; disk very slightly longer than wide, transversely, moderately and evenly convex, very minutely, rather strongly and evenly rugulose; rugulæ sinuous and interrupted; having a very narrow and imperfect median line toward base. *Elytra* at base very slightly wider than the pronotum; sides parallel and feebly arcuate posteriorly; together broadly, triangularly and feebly emarginate behind; disk transversely and moderately convex, one-third longer than wide, one-half longer than the prothorax, feebly impressed along the suture, which is margined with a slightly elevated line, extremely minutely, evenly and densely punctate; punctures asperate and more sparse near the apices. *Abdomen* scarcely perceptibly paler toward tip, transversely strigate with fine wavy lines of extremely minute asperities. *Legs* moderate; anterior tarsi feebly dilated, first joint of the posterior as long as the next two together. Length 3.7–4.2 mm.

Described from the male, in which the sixth segment is narrow and evenly sinuate at the tip, the sinus being evenly rounded and about four times as wide as deep. The species is one of the most distinct of this portion of the genus, and is widely extended in distribution throughout the middle coast region; it is distinguishable at once by its very dense sculpture, dark color and very dense pubescence of the posterior portions of the body.

2—**C. continens** n. sp.—Moderately robust, rather depressed; head and abdomen black, the latter paler and brownish-ferruginous at apex; prothorax and elytra dark castaneous-brown, the latter slightly the paler; under surface paler, castaneous; legs brownish-flavate; antennæ rufo-fuscous throughout; maxillary palpi piceous-black; head and pronotum almost glabrous, having a few erect black setæ; elytra and abdomen finely and moderately densely pubescent. *Head* moderate, slightly longer than wide; sides parallel and feebly arcuate; base truncate, basal angles distinctly rounded; eyes small, moderately prominent, in great part visible from above, one and one-half times their own length from the base; occiput moderately convex, front flat anteriorly; punctures fine, round, shallow, sub-annular and extremely dense; antennæ nearly as long as the head and prothorax together, slender, not incrassate; basal joint as long as the next two together, second much shorter and more oval than the third, tenth longer than wide. *Prothorax* large, nearly as long as and very slightly wider than the head; sides just visibly convergent from apex to base and very feebly arcuate; base broadly arcuate, sub-truncate in the middle; apex broadly arcuate, as strongly so as the base, narrowly and very feebly emarginate in the middle; apical angles narrowly but distinctly rounded, basal more broadly so; disk transversely and moderately convex, quadrate, very finely, evenly and strongly rugulose, the very fine median line being entirely obsolete in the apical half. *Elytra* at base just visibly wider than the pronotum; sides parallel, very feebly arcuate posteriorly; together broadly and just visibly incurvate at the apex; disk transversely and feebly convex, very feebly impressed along the suture which is very slightly and narrowly elevated, one-fourth longer than wide, slightly less than one-half longer than the pronotum, very minutely densely and evenly punctate; punctures sub-asperate and slightly sparser near the apices. *Abdomen* transversely strigate with very fine wavy lines of minute closely-placed asperities. *Legs* moderate; anterior tarsi very feebly swollen; first four joints of the posterior decreasing uniformly and very rapidly in length, first slightly shorter than the next two together, fourth very slightly longer than wide; claws very small. Length 3.4 mm.

Contra Costa Co., 2; Napa Co., 1; San Diego, 2.

This species, although closely allied to the preceding, is distinguishable from it by its smaller size, more robust form, larger prothorax, coloration of the body, paler abdominal apex, less conspicuous pubescence and shorter first joint of the posterior tarsi. It is described from the male, the sixth segment being sinuate at apex; the sinus is rather more acutely rounded than in *rugosum*, and is about four times as wide as deep. The structure of the labrum is similar to that of *rugosum*.

3—*C. angulatum* n. sp.—Form slender, moderately convex; color throughout black, legs piceous-black, antennæ and palpi same, tarsi piceo-testaceous; pubescence of the elytra and abdomen moderately dense, very fine, recumbent, fulvous in color, sparser and coarser anteriorly except at the sides of the head behind the eyes. *Head* moderate, slightly longer than wide; sides parallel and feebly arcuate; base truncate, angles distinctly rounded; surface moderately convex, depressed anteriorly, very finely and densely punctate; antennæ very slender, nearly as long as the head and prothorax together; basal joint scarcely as long as the next two combined, second and third equal in length, the former scarcely perceptibly more oval, tenth as wide as long. *Prothorax* quadrate; sides just perceptibly convergent posteriorly and nearly straight; base broadly, rather strongly and nearly evenly arcuate, much more strongly so than the apex, which is broadly and rather feebly arcuate and feebly sinuate in the middle; apical angles slightly obtuse and scarcely perceptibly rounded, basal very broadly rounded; disk scarcely wider than the head, moderately convex, very finely, rather strongly and irregularly rugulose; median line rather obsolete. *Elytra* at base very slightly wider than the head; sides parallel and feebly arcuate; together broadly, triangularly and distinctly emarginate behind; disk transversely and very moderately convex, very feebly impressed along the suture toward base, not impressed toward the apex, scarcely one-third longer than wide, about one-third longer than the prothorax, extremely minutely, densely and evenly punctate; punctures asperate and not sparser near the apex. *Abdomen* having the sixth and the apex of the fifth segments very slightly paler, piceo-testaceous; surface transversely and finely strigate in wavy and very broken rows of minute and closely-placed asperities. *Legs* moderate; first joint of the posterior tarsi slightly shorter than the next two together. Length 3.5 mm.

San Mateo Co., 3 (Mr. Fuchs).

Described from the male; the sixth segment is sinuate at apex, the sinus being very broadly rounded and about six times as wide as deep.

This species may be distinguished by its black color, dark legs and coarse pubescence of the head, but especially by the shape of the prothorax, in which the anterior angles are not distinctly rounded.

4—*C. mobile* n. sp.—Rather slender, black throughout, apices of the elytra just visibly paler, fuscous; legs dark brown, castaneous, tarsi testaceous; antennæ piceous, fuscous toward tip; pubescence of the elytra and abdomen very fine, short and extremely dense, sericeous, fulvous, that of the head and pronotum excessively fine, rather sparse, dark piceo-cinereous and scarcely visible. *Head* moderate; sides parallel and feebly arcuate; base truncate, angles rather broadly rounded; surface moderately convex, rather coarsely and densely punctate, more finely so behind, with a narrow median impunctate line; punctures round, feeble; between the antennæ there are two rather large setigerous punctures; labrum with four small, robust, triangular teeth; antennæ distinctly shorter than the head and prothorax together, very feebly incrassate, rather slender; basal joint as long as the next two together, second scarcely two-thirds as long as the third and equal in length to the fourth, tenth slightly longer than wide. *Prothorax* nearly quadrate; sides parallel and distinctly arcuate; base and apex evenly, rather strongly, and nearly equally arcuate, the latter with a small feeble median sinuation; apical angles rather broadly rounded, basal very broadly so; disk transversely and rather feebly convex, very slightly wider than the head, evenly finely and extremely densely punctate; punctures very feebly impressed, almost contiguous; median line almost obsolete. *Elytra* at base just perceptibly wider than the pronotum; sides very feebly divergent and feebly arcuate; together broadly, evenly and rather strongly sinuate at apex; disk transversely and moderately convex, one-fourth longer than wide, nearly one-half longer than the pronotum, feebly impressed on either side of the slightly elevated suture, rather finely and very densely punctate; punctures slightly asperate and much finer near the apex. *Abdomen* nearly as wide as the elytra; sides of the fifth segment feebly convergent toward tip; surface transversely strigate in close wavy lines of minute asperities; each segment having one or two transverse rows of four to six very small setigerous punctures upon both the dorsal and ventral disks. *Legs* slender; first joint of the posterior tarsi slightly shorter than the next two together, as long as the last two, one-half longer than the second. Length 4.0 mm.

Monterey Co.. 2. ♀

Described from the female in which the sixth segment is very evenly rounded behind. There are many erect bristling setæ on the abdomen toward tip; the transverse series of discal punctures upon the abdomen are characteristic of this

entire genus, but are more conspicuous in those species having very dense sericeous abdominal pubescence. This species is very distinct being distinguished by its size and very dense punctuation, also by the rather more transversely oval pronotum with broadly rounded anterior angles.

5—**C. contractum** n. sp.—Slender, black; elytra slightly paler, piceous, slightly rufous at the apices; legs pale brownish-testaceous, tarsi paler, brownish-flavate; antennæ dark rufo-testaceous throughout; maxillary palpi piceous-brown; entire under surface same; pubescence of the elytra moderately dense, very short and fine, that of the abdomen much longer, coarser and denser, that of the head and pronotum excessively fine, rather sparse and not conspicuous. *Head* moderate; sides extremely feebly convergent posteriorly and very slightly arcuate; base truncate, angles narrowly rounded; surface slightly longer than wide, moderately convex, rather coarsely and somewhat sparsely punctate, with a narrow median impunctate line; two setigerous punctures at the apical margin of the epistoma large and prominent; antennæ slender, nearly as long as the head and prothorax together; basal joint scarcely as long as the next two together, second two-thirds as long as the third and slightly longer than the fourth, tenth about as long as wide, eleventh ovoidal, acuminate, slightly shorter than the preceding two combined. *Prothorax* quadrate, distinctly wider than the head; sides parallel and distinctly arcuate; base rather broadly and strongly arcuate, slightly more strongly so than the apex; apical angles rather narrowly rounded, basal very broadly so; disk transversely and moderately convex; median line obsolete, or very nearly so; very finely, feebly and densely punctate; punctures very feebly impressed and separated by their own widths. *Elytra* at base very slightly wider than the pronotum; sides nearly parallel, feebly arcuate, distinctly more strongly so near the apices; together broadly, angularly and very feebly emarginate at the apex; disk convex and declivous at the sides, depressed in the middle, feebly impressed on either side of the feebly elevated suture, scarcely one-fourth longer than wide, one-third longer than the prothorax, rather coarsely and densely punctate; punctures much finer and more asperate near the apex. *Abdomen* slightly narrower than the elytra; sides parallel; sides of the fifth segment strongly convergent posteriorly; surface rather convex, transversely strigate in very disconnected wavy lines of moderately coarse asperities. *Legs* slender; first joint of the posterior tarsi nearly as long as the next two together. Length 3.2–3.6 mm.

Santa Clara Co., 9; Monterey Co., 4; Humboldt Co., 1.

In the specimen from Humboldt the elytral punctuation is decidedly coarser and denser. The type is a male, the sixth segment being slender and sinuate at apex; the sinus is rather narrowly rounded and about four times as wide as

deep. This species is easily distinguished from *mobile* by its smaller size, sparser pubescence and much sparser punctation.

6—*C. luculentum* n. sp.—Form rather robust, depressed; color black, elytral apices abruptly paler, rufous; apices of the abdominal segments beneath pale; legs pale reddish-ochreous; antennæ uniformly dark rufo-fuscous; palpi piceous; head and pronotum almost glabrous; pubescence of the elytra and abdomen very sparse, fine, dark piceo-fulvous and not at all conspicuous; integuments very highly polished. *Head* short and robust, very slightly wider than long; sides parallel and very feebly arcuate; base truncate, angles narrowly rounded; surface moderately convex, rather coarsely and densely punctate at the sides and base, very sparsely so in the middle where there is a rather wide median impunctate area; interantennal area impunctate, two setigerous punctures widely separated and very feeble; antennæ slender, nearly as long as the head and prothorax together, second joint scarcely two-thirds as long as the third and distinctly shorter than the fourth, tenth as wide as long. *Prothorax* quadrate, very slightly wider than the head; sides very feebly convergent from apex to base; the latter broadly, evenly and rather moderately arcuate; apex with a distinct median sinuation; apical angles somewhat narrowly rounded, basal broadly so; disk moderately convex, very finely, rather deeply, evenly and densely punctate; punctures separated by their own widths. *Elytra* at base very slightly wider than the pronotum; sides just visibly divergent posteriorly and feebly arcuate, distinctly more strongly so behind; together broadly and feebly sinuate at apex; disk one-fourth longer than wide and one-third longer than the pronotum, feebly impressed along the slightly elevated suture except at the apex where the elevation and impressions disappear, rather coarsely, sub-asperately and very densely punctate. *Abdomen* broad, very slightly narrower than the elytra; border narrow; sides parallel and nearly straight; transversely strigate in wavy lines. *Legs* slender; first joint of the posterior tarsi as long as the next two together, second as long as the third and fourth, slightly shorter than the fifth. Length 3.7 mm.

Lake Co., 3. (Mr. Fuchs.)

Described from the male; the sixth segment is sinuate at apex, the sinus being acutely rounded and but slightly more than three times as wide as deep. This species, although somewhat resembling *contractum*, may be at once distinguished by its broader form, much paler elytral apices, highly polished integuments and very sparse pubescence of the elytra and abdomen. The sinus of the sixth segment, although rather acutely rounded as in *contractum*, is relatively distinctly deeper.

7—*C. reductum* n. sp.—Slender, black; elytra piceous, paler and distinctly rufous at the apices; femora rather pale castaneous-brown, tibiae and tarsi paler, brownish-flavate; under surface dark castaneous, tip of the abdomen slightly paler; antennae dark rufo-testaceous; pubescence of the elytra very short, fine and rather sparse, that of the abdomen much longer, coarser and twice as dense; head and pronotum almost glabrous. *Head* robust, scarcely longer than wide; sides parallel and nearly straight; base truncate, angles rather broadly rounded; surface rather finely and sparsely punctate, especially toward the middle, where there is a rather broad impunctate line; antennae distinctly shorter than the head and prothorax together, somewhat robust; basal joint as long as the next two together, second very slightly shorter than the third, joints two and four equal in length, fifth slightly shorter. *Prothorax* quadrate, just visibly wider than the head; sides feebly convergent toward base and very feebly arcuate; base and apex broadly, equally and not strongly arcuate; apical angles rather narrowly rounded, basal very broadly so; disk transversely and rather feebly convex, finely, densely and evenly punctate; punctures rounded, feebly impressed and distant by about their own widths; median line almost entire, very narrow. *Elytra* at base very slightly wider than the pronotum; sides nearly parallel and feebly arcuate, more strongly so behind; together broadly, evenly and very feebly sinuate at apex; disk one-fourth longer than wide and one-third longer than the prothorax, narrowly impressed along the feebly elevated suture, except toward tip, where the impression is obsolete, finely, rather densely and sub-asperately punctate; punctures scarcely perceptibly smaller toward the apex. *Abdomen* distinctly narrower at base than at the fourth segment, slightly narrower than the elytra; sides feebly arcuate; sides of the fifth segment distinctly convergent toward tip; surface transversely and finely strigate in very disconnected wavy lines. *Legs* slender; first joint of the posterior tarsi about as long as the next two together, second as long as the fifth. Length 3.0 mm.

Monterey Co., 5.

This species is distinguished from *contractum* by its smaller size, shorter and broader head, which is also more sparsely punctate, and by the form of the prothorax, in which the sides are feebly but distinctly convergent from apex to base. The type is a male, the sixth segment being rather broad and sinuate at apex; the sinus is broadly rounded and about four times as wide as deep. In *contractum* the sinus is much more acutely rounded, although about equally deep, the sides being more gradually recurved exteriorly.

8—*C. tantillum* n. sp.—Very slender; head black; abdomen piceous-black; pronotum and elytra castaneous, the latter slightly paler at tip; legs rather pale brownish, tarsi paler, brownish-flavate; antennæ uniformly dark rufous throughout; pubescence of elytra and abdomen very fine, moderately sparse and not conspicuous. *Head* moderate, slightly longer than wide, sides parallel and almost straight; base truncate, angles narrowly rounded; surface moderately convex, rather coarsely and sparsely punctate, with a rather wide median impunctate area; antennæ slender, short, much shorter than the head and prothorax together; basal joint as long as the next two together, second slightly shorter and more robust than the third, as long as the fourth, outer joints very slightly wider, teeth as wide as long. *Prothorax* quadrate, scarcely perceptibly wider than the head; sides just visibly convergent from apex to base and nearly straight; base and apex broadly, equally and rather strongly arcuate; apical angles rather broadly rounded, basal very broadly so; disk transversely and moderately convex, very minutely, feebly, evenly and rather sparsely punctate, with a narrow but entire and rather well-marked median impunctate line; punctures very feebly impressed and separated by about three times their own widths; surface feebly alutaceous. *Elytra* at base very slightly wider than the pronotum; sides parallel and very feebly arcuate; together broadly, sub-angularly and moderately sinuate at apex; disk nearly one-third longer than wide, and nearly one-half longer than the pronotum, narrowly impressed along the slightly elevated suture, rather finely, densely and sub-asperately punctate; punctures smaller near the apex. *Abdomen* very slightly narrowed toward base, nearly as wide as the elytra; surface moderately convex, very minutely, sub-asperately, feebly and rather sparsely punctate. *Legs* slender; first joint of the posterior tarsi as long as the next two together, about as long as the fifth; second distinctly shorter than the third and fourth combined. Length 2.8 mm.

Santa Clara, Co., 4.

Described from the male in which the sixth segment is sinuate at tip, the sinus being moderately broadly rounded and between three and four times as wide as deep.

This species is at once distinguishable from all the others above described by the abdominal punctuation which is not arranged in very well-defined wavy lines, by the more sparse and minute pronotal punctuation, and by the rather strong dilatation of the joints of the anterior tarsi in the males. It is also the smallest species of the genus.

OLIGOPTERUS n. gen.

The very small species constituting the sole representative of this genus, is very singular and totally distinct in

appearance from those of the preceding group. The head, instead of being small is rather large and very coarsely punctate, the prothorax being slightly elongate and rather strongly narrowed from apex to base; the elytra are equal in length to the pronotum in the male and slightly shorter in the female, with the sides strongly divergent posteriorly, having the surface depressed and very coarsely punctate.

9—*O. cuneicollis* n. sp.—Rather slender; head and abdomen piceous-black; elytra dark blackish-castaneous; pronotum dark rufo-fuscous; legs brownish-piceous, tibiae slightly paler, tarsi still paler; antennae and under surface anteriorly dark rufo-fuscous, the former much paler toward the base and apex; abdomen black, with the extreme apices of the segments paler; head and pronotum nearly glabrous, elytra and abdomen finely and rather densely pubescent; integuments polished. *Head* very slightly longer than wide; sides parallel and slightly arcuate; base truncate, feebly sinuate in the middle, angles rather broadly rounded; eyes very small, at three times their length from the base; surface rather depressed, coarsely and rather sparsely punctate, with a very narrow median impunctate line; epistoma rather strongly produced, sides convergent to the apex and feebly sinuate; apex truncate; antennal tuberculations small and rather prominent; between them there are two small, oblique, impressed foveae, each having a small setigerous puncture posteriorly; antennae rather short, scarcely as long as the head and prothorax together; basal joint slightly longer than the next two together, second more robust but scarcely shorter than the third. *Prothorax* scarcely narrower than the head; sides distinctly convergent from apex to base and slightly arcuate; base broadly and feebly arcuate; apex with the sides very strongly convergent to the neck, which is one-third as wide as the disk and broadly and feebly emarginate; anterior angles obtuse and rather broadly rounded, basal equally so; disk transversely and rather strongly convex, slightly longer than wide, rather finely and moderately densely punctate, with a narrow, entire, impunctate median line. *Elytra* at base slightly narrower than the pronotum; sides rather strongly divergent posteriorly and feebly arcuate; together broadly and feebly sinuate at the apex; disk depressed, very slightly longer than wide, as long as the pronotum, very coarsely, sub-asperately and rather densely punctate. *Abdomen* at base very slightly narrower than the elytra; sides very feebly divergent posteriorly and distinctly arcuate; surface minutely, feebly, densely, sub-asperately and irregularly punctate. *Legs* very slender; first joint of the posterior tarsi fully as long as the next two together. Length 2.4–2.6 mm.

San Francisco, 5.

The elytra are, except near the apex, narrowly impressed along the slightly elevated suture. The type is a male, the

sexual characters being merely a slight emargination at the apex of the sixth segment, slightly wider than deep and not at all rounded, triangular. This species cannot be confounded with any other here described; it is the smallest of this group of genera which has been thus far discovered.

LITHOCHARIS Lacord.

Group A.

We have here another group, of four species, remarkably distinct from either of the preceding. The size is larger than in any of the other genera, and the large, sub-triangular, very finely and densely punctate heads with their very minute eyes, give them a very peculiar appearance which renders them immediately recognizable. The elytra are short, sometimes equal in length to the prothorax and never very much longer. The sides of the prothorax are usually very distinctly convergent from apex to base, and are sometimes feebly sinuate in the middle.

10—*L. sinuatocollis* n. sp.—Form rather slender; elytra and abdomen dark fuscous, the latter paler at tip; head and pronotum slightly paler, dark rufo-testaceous; antennæ dark fuscous, paler at the apex; legs rather pale ferruginous throughout; pubescence rather sparse. *Head* rather large, much longer than wide, broadly sinuate at base, angles rather broadly rounded; sides long, very feebly convergent anteriorly and distinctly arcuate; epistoma very broad, moderately produced, apex truncate; surface broadly and moderately convex, rather finely and densely punctate, very feebly alutaceous; punctures feebly impressed, distant by nearly twice their own widths; median impunctate area rather narrow; eyes very small at nearly four times their own length from the base; antennæ slender, much shorter than the head and prothorax together; basal joint as long as the next two together, second and third sub-equal in length, the former slightly more robust and much more oval, distinctly longer than the fourth, tenth slightly wider than long. *Prothorax* quadrate, very slightly narrower than the head; sides rather strongly convergent posteriorly throughout and feebly sinuate in the middle; base broadly truncate in the middle, arcuate at the sides; apex broadly arcuate, feebly and roundly emarginate in the middle third; anterior angles rather broadly rounded, basal slightly more broadly so; disk moderately convex, finely, rather feebly and sparsely punctate; median line equal throughout the length, moderate in width. *Elytra* at base very slightly narrower than

the pronotum; sides moderately strongly divergent and feebly arcuate toward the apex; together broadly and feebly sinuate behind; disk about as long as wide; as long as the pronotum, depressed, feebly impressed throughout near the suture which is feebly elevated, rather coarsely, moderately densely and sub-rugulose punctate. *Abdomen* at base very nearly as wide as the elytra; sides just visibly divergent posteriorly and straight; surface very minutely, densely, irregularly, feebly and sub-asperately punctate. *Legs* long and slender; tarsi rather short, first joint of the posterior much shorter than the next two together, scarcely as long as the fifth, one-third longer than the second; first four joints uniformly decreasing in length. Length 4.6 mm.

Humboldt Co. (Hoopa Val.), 2 ♀.

The anterior tarsi are feebly dilated toward base. This species may be readily recognized amongst the large species with short elytra, by its much paler color, slightly coarser and sparser cephalic punctuation, and by the distinctly sinuate sides of the prothorax.

11—*L. convergens* n. sp.—Form moderately robust, black throughout; legs dark piceous-brown, tarsi paler, testaceous; antennæ fuscous, paler toward the apex; pubescence very fine, rather long, very sparse anteriorly, more dense on the elytra, still denser and more sericeous on the abdomen. *Head* large, broadly sinuate at base, angles rather broadly rounded; sides long, feebly convergent anteriorly, distinctly and evenly arcuate; eyes very small; epistoma very slightly produced, broad, squarely truncate at apex; surface finely and densely punctate, very feebly alutaceous; punctures rather feebly impressed, distant by scarcely more than their own widths above; median line narrow; antennæ one third longer than the head, rather slender, second joint distinctly shorter than the third, very slightly longer than the fourth, tenth slightly wider than long. *Prothorax* widest at the apex where it is slightly narrower than the head and distinctly wider than long; sides moderately strongly convergent posteriorly, very feebly and evenly arcuate; base broadly and rather feebly arcuate; apex rather more strongly arcuate, broadly sinuate in the middle two-fifths; anterior angles rather broadly rounded, basal very broadly so; disk finely, very feebly and sparsely punctate, with an entire and rather wide median impunctate area, and, especially toward base, a very fine and feebly impressed median stria. *Elytra* at base distinctly narrower than the pronotum; sides rather strongly divergent and nearly straight; together broadly, feebly and sub-angularly sinuate at the apex; disk about as wide as long, slightly longer than the pronotum, depressed, feebly impressed along the slightly elevated suture, except at the apex, moderately coarsely, densely and evenly punctate; punctures feebly sub-rugulose. *Abdomen* at base distinctly narrower than the elytra; sides slightly divergent posteriorly; surface very finely, densely, irregularly and sub-asperately punctate. *Legs* rather short and slen-

der; first four joints of the posterior tarsi decreasing uniformly and rather rapidly in length, fourth longer than wide and one-half as long as the first. Length 4.5 mm.

San Mateo Co., 1 ♀ (Mr. Fuchs).

The anterior tarsi are very distinctly dilated toward base. This species can be at once recognized by its black color, slightly transverse prothorax, and the sides of the latter, which are slightly arcuate and not at all sinuate.

12—*L. lepida* n. sp.—Rather robust, dark piceous throughout, head and pronotum scarcely perceptibly paler; abdomen very slightly paler at the immediate apex; legs pale, ferruginous-yellow; antennae dark fuscous, pale testaceous at tip, basal joint dark rufous; pubescence rather long and dense on the elytra and abdomen, denser and more sericeous on the latter, elsewhere very sparse; integuments very feebly alutaceous, shining. *Head* large, sub-triangular; base broadly and feebly sinuate, angles rather broadly rounded; sides very feebly convergent anteriorly, long, distinctly arcuate; epistomal apex broad, squarely truncate; antennal tuberculations very small and rather feeble; surface finely, densely and evenly punctate; median line rather narrow; antennae slender, much shorter than the head and prothorax together, second joint distinctly shorter than the third and slightly longer than the fourth, tenth as long as wide. *Prothorax* as long as wide, distinctly narrower than the head; sides feebly convergent from apex to base, straight in the middle; base broadly truncate in the middle; basal angles broadly rounded, apical very slightly less so; sides thence very strongly convergent and straight to the nuchal emargination, which is more than one-third as wide as the disk and very broadly rounded; disk transversely and very feebly convex above, strongly and rather abruptly so at the sides, finely and feebly punctate, sparsely so near the middle, more coarsely and closely at the sides; median line rather broad, equal throughout; very near the base there is a very feeble median stria. *Elytra* at base just perceptibly narrower than the pronotum; sides feebly divergent posteriorly and nearly straight; together broadly and extremely feebly sinuate behind; disk distinctly longer than wide and slightly longer than the pronotum, rather depressed, narrowly impressed along the slightly elevated suture, rather finely, evenly, densely and sub-rugulose punctate. *Abdomen* at base very slightly narrower than the elytra; sides very feebly divergent posteriorly, nearly straight; surface very minutely and densely, feebly and sub-asperately punctate. *Legs* moderate; first joint of the posterior tarsi one-half longer than the second, slightly longer than the fifth. Length 5.0 mm.

Santa Clara Co., 3.

The description is taken from the male, in which the fifth segment is transversely truncate at apex, the edge being

very broadly and feebly undulated and with a transverse row of stiff recumbent setæ slightly within the margin; sixth broadly and deeply sinuate, the sinus being twice as wide as deep and very broadly rounded anteriorly; seventh narrowly divided. The species is easily distinguishable from the preceding two by its much longer elytra in both the male and female.

13—*L. puberula* n. sp.—Moderately slender, piceous-black throughout, abdominal apex not noticeably paler; legs dark reddish-brown; antennæ fuscous, apex paler; head and pronotum sparsely, rather coarsely and somewhat distinctly pubescent; pubescence of the elytra and abdomen rather long, coarse and somewhat dense, rather conspicuous, pale fulvous throughout; integuments very feebly alutaceous, shining. *Head* moderate; base broadly and very feebly sinuate, angles rather narrowly rounded; sides parallel and distinctly arcuate, slightly more strongly so behind; epistomal apex moderate in width, broadly and very feebly arcuate; surface very finely, densely and extremely feebly punctate; median line narrow, interrupted at the base and with an elongate very feebly elevated ridge anteriorly; antennæ very slightly shorter than the head and prothorax together; slender, second joint two-thirds as long as the third and distinctly longer than the fourth, tenth very slightly wider than long. *Prothorax* quadrate, just visibly narrower than the head; sides feebly convergent posteriorly throughout and very feebly arcuate; base broadly truncate in the middle; apical angles rather broadly rounded, basal very broadly so; disk transversely and rather strongly convex very finely, feebly and sparsely punctate, more densely so at the sides; median line broad and well marked, having a short impressed median stria near the base. *Elytra* at base sub-equal in width to the pronotum; sides rather feebly divergent posteriorly and very feebly arcuate; together broadly and moderately sinuate behind; disk very slightly longer than the pronotum, slightly longer than wide, moderately depressed, narrowly impressed along the slightly elevated suture, moderately coarsely, closely and sub-granulosely punctate, the punctures being extremely minute and at the summits of fine elevated granules. *Abdomen* at base nearly as wide as the elytra; sides very feebly divergent posteriorly and nearly straight, very minutely, feebly, irregularly and sub-asperately punctate, the bases of the basal segments being impunctate. *Legs* rather robust; first joint of the posterior tarsi very slightly longer than the second, nearly twice as long as the fourth; anterior tarsi narrowly dilated. Length 4.8 mm.

Lake Co., 1 ♂ (Mr. Fuchs).

Sexual characters nearly as in *lepidula*, the situation of the sixth segment being very broadly rounded and three times



as wide as deep. This species is distinguished from *sinuotocollis* and *convergens* by its longer elytra and shape of the pronotum, from *lepida* by its sexual characters, denser pubescence, color, and especially by its much narrower, more densely punctate, and more parallel head.

Group B.

The species here assigned to this group of the genus are in general quite homogeneous in appearance, the elytra being always much longer than the prothorax, and the pronotum always very sparsely and feebly punctate in the middle, with a broad median impunctate area. They, however, vary in the degree of density of the cephalic punctuation, in the prominence of the basal angles, and slightly in the form of the pronotum, this generally being nearly quadrate with the sides parallel, but sometimes having the sides distinctly convergent from apex to base, and being in some cases slightly wider than long and in others longer than wide, within, however, very narrow limits. The head is usually moderate in size, sub-quadrate, and never very much wider than the prothorax.

14—*L. malaca* n. sp.—Rather robust, depressed; piceous-black, abdomen paler at tip; pronotum slightly paler, dark rufo-fuscous; legs pale yellowish-testaceous throughout; antennæ fuscous, pale testaceous at tip; pubescence sparse anteriorly, rather coarse, dense and conspicuous on the elytra and abdomen; integuments strongly shining, very feebly sub-alutaceous. *Head* rather large, slightly longer than wide; sides moderately long and distinctly arcuate; base broadly truncate, angles rather broadly rounded; eyes moderate, at twice their length from the base; epistoma moderately produced, very broad, sides strongly convergent to the apex, which is squarely truncate; antennal tuberculations very small, rather prominent; surface very even, moderately convex, very finely, evenly and densely punctate, with a narrow, even, impunctate line in the middle; antennæ slightly shorter than the head and prothorax together; basal joint nearly as long as the next three together, second very slightly shorter than the third and longer than the fourth, tenth as long as wide. *Prothorax* very slightly wider than long and just visibly narrower than the head; sides very feebly convergent throughout and very slightly arcuate; base and apex broadly, moderately and almost equally arcuate, the former sub-truncate in the middle; anterior angles

rather broadly rounded, basal slightly more broadly so; apical emargination feeble, one-third as wide as the disk; the latter transversely and very moderately convex, very finely, feebly and sparsely punctate in the middle, more strongly and densely so near the sides, with a wide median impunctate area, having a very small feeble impression near the base. *Elytra* at base distinctly wider than the pronotum; sides parallel and very slightly arcuate; together broadly and rather feebly sinuate behind; disk transversely and moderately convex, narrowly impressed along the distinctly elevated suture, very finely, rather densely and sub-granulose punctate, scarcely one-fourth longer than wide, two-fifths longer than the pronotum. *Abdomen* at base very slightly narrower than the elytra; sides parallel and feebly arcuate; surface very minutely, densely, irregularly and sub-asperately punctate. *Legs* robust; first joint of the posterior tarsi one-third longer than the second. Length 4.3 mm.

Santa Clara Co., 1 ♂.

The fifth ventral segment is broadly emarginate in its middle, three-fourths at apex, the emargination being broadly rounded and six times as wide as deep; in the middle there is a short and very broad porrected process at the bottom of the notch, which is broadly and feebly sinuate at its apex, each side of the emargination having elsewhere a porrected fringe of short, robust, very closely-placed spinules, about eleven in number; sixth segment deeply emarginate at apex, the notch being parabolic in outline and slightly wider than deep, exterior angles slightly rounded; seventh narrowly divided.

This species is distinguished from all the others in this division of the genus by its rather large and very minutely punctate head. The anterior tarsi are rather strongly dilated and clothed beneath with very short, pale, densely-placed papillæ.

15—*L. latiuscula* n. sp.—Rather robust and depressed; head and abdomen piceous-black, the latter very slightly paler at the apex; pronotum dark rufous; elytra much paler, rufous throughout; labrum, palpi and legs concolorous, pale reddish-flavate throughout; antennæ fuscous; base dark rufous, apex testaceous; pubescence very sparse anteriorly, long, very fine and rather sparse on the elytra and abdomen; integuments polished, very finely sub-alutaceous. *Head* moderate, slightly wider than long exclusive of the labrum which is large and prominent; teeth very small, acute; base broadly truncate angles rather broadly rounded; sides parallel and nearly straight; surface

rather coarsely, very feebly and rather sparsely punctate; median impunctate area rather broad, sub-fusiform; epistoma moderately produced, broad, feebly and abruptly arcuate in the middle at the apex; antennal tuberculations small and rather conspicuous; antennæ nearly as long as the head and prothorax together; basal joint as long as the next two combined, second more than twice as long as wide, very slightly shorter than the third, distinctly longer than the fourth, tenth as long as wide. *Prothorax* slightly wider than long, very slightly narrower than the head; sides distinctly convergent posteriorly throughout and nearly straight; basal angles very obtuse and very slightly rounded, sides of the base thence strongly convergent and broadly arcuate to the median portion which is almost squarely truncate; apex broadly and very feebly arcuate; nuchal emargination very feeble, nearly one-half as wide as the disk; apical angles rather narrowly rounded; disk rather coarsely, excessively feebly and very sparsely punctate; median impunctate area broad, equal throughout, surface not impressed. *Elytra* at base slightly wider than the pronotum; sides almost parallel and very slightly arcuate; together broadly, sub-angularly and very feebly sinuate behind; disk broadly and feebly convex, narrowly and rather strongly impressed along the slightly elevated suture, scarcely one-fourth longer than wide, one-third longer than the pronotum, rather finely, evenly, strongly, rather densely and sub-asperately punctate. *Abdomen* rather short and broad, slightly narrower than the elytra; sides parallel and slightly arcuate; surface very finely, densely and sub-asperately punctate. *Legs* rather short and robust; anterior tarsi slightly dilated; first joint of the posterior one-half longer than the second, nearly twice as long as the fourth and slightly shorter than the fifth. Length 4.1 mm.

Lake Co., 1 (Mr. Fuchs); Southern Cal., 1 (Mr. G. W. Dunn).

The two specimens, of which the first is the type, are both females, and agree tolerably well together, although the one from the possible neighborhood of Los Angeles, has the head slightly narrower and more strongly arcuate behind with the basal angles more broadly rounded, the prothorax very slightly longer, and the elytra very slightly shorter and more finely punctate. There is a strong probability of its being at least a well-marked variety, although lack of material prevents any judgment as to the amount of specific variation; in other portions of this group, however, where the material is ample, the specific variation is seen to be very slight.

16--*L. sublesta* n. sp.—Very moderately robust; head and abdomen black, the latter scarcely paler at tip; pronotum very dark fuscous; elytra dark yellowish-rufous; labrum and antennæ fuscous, the latter pale testaceous toward tip; palpi slightly paler, brownish; legs pale brownish-flavate throughout; pubescence very sparse anteriorly, moderately dense and fine on the elytra, very dense, fine and sericeous on the abdomen; shining. *Head* moderate, as long as wide; base broadly arcuate, angles broadly rounded; sides parallel and nearly straight; eyes at nearly twice their length from the base, somewhat prominent; epistoma moderately produced, truncate at tip; labrum moderate in size; occiput moderately convex, finely and somewhat densely punctate, more sparsely so in the middle; median impunctate area narrow; antennæ nearly as long as the head and prothorax together, basal joint scarcely as long as the next two combined, second nearly as long as the third, slightly longer than the fourth, tenth as long as wide. *Prothorax* very slightly wider than long, equal in width to the head; sides parallel and feebly arcuate; base broadly, evenly and moderately arcuate throughout; apex very feebly arcuate; nuchal emargination excessively feeble, rather wide; apical angles rather broadly rounded, basal more broadly so; disk transversely, evenly and feebly convex, finely margined along the base, extremely feebly, finely and sparsely punctate above, three times as densely so near the sides; median impunctate area rather broad. *Elytra* at base distinctly wider than the prothorax; sides parallel and feebly arcuate; together broadly and very feebly sinuate behind; disk depressed above, strongly convex at the sides, narrowly and distinctly impressed along the slightly elevated suture, one-fifth longer than wide and nearly one-half longer than the pronotum, very minutely, rather feebly, densely, evenly and sub-asperately punctate. *Abdomen* very slightly narrower than the elytra; sides parallel and very feebly arcuate; surface minutely, exceedingly densely and evenly punctato-asperate. *Legs* rather long and slender; anterior tarsi rather strongly dilated, posterior long and slender, first joint about one-fourth longer than the second, slightly shorter than the fifth and as long as the third and fourth together. Length 4.2 mm.

Napa Co., 1 ♂.

The fifth segment is broadly impressed in the middle throughout its length; the apex is very broadly emarginate, the sides of the notch being rather feebly convergent anteriorly and each having a fringe of about eight robust spinules; in the middle of the emargination there is a very short broad process, broadly arcuate posteriorly; sixth segment parabolically emarginate, notch one-half wider than deep; seventh narrowly divided.

17—*L. consanguinea* n. sp.—Moderately robust and depressed; head, pronotum and abdomen black, the latter very slightly paler at the apex; elytra dark

piceo-castaneous; femora piceo-castaneous, tibiæ and tarsi paler, brownish-rufous; antennæ piceous at base, becoming fuscous in the middle and pale testaceous at tip; palpi fuscous; integuments polished, very feebly sub-alutaceous; pubescence anteriorly very sparse, that of the elytra coarse, not very dense, that of the abdomen more than twice as dense, sericeous, fulvous and conspicuous. *Head* moderate, as long as wide; base broadly and very feebly arcuate, angles rather broadly rounded; sides parallel and extremely feebly arcuate; epistoma rather strongly produced, broad, truncate at tip; antennal tuberculations small, rather prominent; surface rather finely and moderately densely punctate; median line narrow, continuous throughout; antennæ slightly shorter than the head and prothorax together; second joint distinctly shorter than the third, very slightly longer than the fourth. *Prothorax* large, just visibly wider than the head, slightly wider than long; sides parallel, extremely feebly arcuate; base broadly, evenly and rather strongly arcuate; apex broadly and very feebly so; nuchal emargination one-third as wide as the disk, very feeble; apical angles rather narrowly rounded, basal broadly so; disk transversely, nearly evenly and rather feebly convex, finely, very feebly and rather sparsely punctate in the middle, slightly more densely so at the sides; median impunctate area broad, equal, narrowly, very feebly and longitudinally impressed near the base. *Elytra* at base distinctly wider than the pronotum; sides very slightly divergent posteriorly and slightly arcuate, together broadly and rather strongly sinuate behind; disk feebly convex, narrowly impressed along the slightly elevated suture, more strongly so at one-third the length from the apex, finely, deeply, sub-asperately, evenly and rather densely punctate; slightly longer than wide, and less than one-third longer than the pronotum. *Abdomen* rather short and broad, as wide as the elytra; sides parallel and distinctly arcuate; surface minutely very densely and sub-asperately punctate. *Legs* slender; first joint of the posterior tarsi one-third longer than the second, nearly as long as the third and fourth together. Length 4.2 mm.

San Francisco, 1 ♀.

This species may be distinguished from the preceding by its shorter and more coarsely and sparsely punctured elytra, its much longer and more evenly punctate pronotum, and especially by its different coloration.

18—*L. contigua* n. sp.—Form rather slender, rather strongly convex; head, pronotum and abdomen black, the latter very slightly paler at tip; elytra piceous-black, immediate apex slightly paler; femora castaneous, tibiæ and tarsi fuscous; labrum, palpi and antennæ piceous, the latter paler and fuscous toward tip; pubescence of the anterior portions sparse, of the elytra moderately dense, long, rather coarse, of the abdomen dense, somewhat sericeous, fulvous; integuments polished, not at all alutaceous. *Head* rather small, distinctly longer than wide; base truncate, angles rather broadly

rounded; sides parallel, nearly straight; epistoma rather strongly produced, broadly and very feebly arcuate at the apex; antennal tuberculations minute and slightly prominent; labrum rather large teeth minute, very acute; antennae slightly shorter than the head and prothorax together, second joint two-thirds as long as the third and scarcely longer than the fourth; occiput rather convex, somewhat finely, evenly and sparsely punctate; punctures round and rather deep; median impunctate area rather broad, equal throughout, well-marked. *Prothorax* quadrate, just visibly narrower than the head; sides parallel and nearly straight; base broadly, rather strongly and evenly arcuate; apex broadly and very feebly so; nuchal sinuation very feeble, two-fifths as wide as the disk; apical and basal angles rather broadly and nearly equally rounded; disk transversely, evenly and rather strongly convex, finely margined along the base, very finely, feebly and somewhat sparsely punctate in the middle, twice as densely so at the sides; median impunctate area equal throughout, moderately wide, with a very fine feeble median stria near the base. *Elytra* at base distinctly wider than the prothorax; sides parallel and feebly arcuate; together broadly, sub-angularly and distinctly sinuate behind disk one-fourth longer than wide, nearly one-half longer than the pronotum, feebly impressed along the slightly elevated suture, rather finely, densely, strongly and rugulose punctate, the punctures being in transverse wavy series near the apex. *Abdomen* slightly narrower than the elytra; sides parallel and nearly straight; surface very minutely, densely and sub-asperately punctate. *Legs* rather long and slender; first joint of the posterior tarsi one-half longer than the second, shorter than the next two together, fully as long as the fifth; anterior tarsi very slightly dilated. Length 4.3 mm.

San Mateo Co., 1 ♂ (Mr. Fuchs).

The fifth segment is very broadly emarginate nearly throughout its width at apex, the sides of the notch being straight, very strongly convergent, and each having a fringe of seven stout, equal and closely-placed spinules; median projected process very short and broad, very strongly sinuate at the apex; sixth segment parabolically emarginate at apex, notch nearly twice as wide as deep; seventh broadly divided, incisure in the form of a very elongate acute triangle.

This species is remarkable for the unusually elongate basal joint of the posterior tarsi, which, however, comes well within the generic definition. It bears a considerable resemblance to *consanguinea*, but differs in the narrower form, and especially in the form of the pronotum, which is as long as wide in the present species and slightly, though

very distinctly, wider than long in the former. It is true that the sexes in these cases are different, but on examining a full series of a closely-allied species—*retrusa*—described below, it is readily seen that the sexual differences in the general form of the body, even of the head, are almost absolutely inappreciable; it is in fact a forcible instance of what Dr. LeConte (Trans. Am. Ent. Soc. VI, p. 213) calls the polarity and, it might be added, concentration of sexual characters. Here we have the sexual modifications at the abdominal vertex extremely well marked, elsewhere, however, if we except a slightly longer second antennal joint in the males, they are not at all apparent.

19—*L. luctuosa* n. sp.—Form slender; head, pronotum and abdomen throughout black; elytra rufo-piceous, not paler at tip; legs dark brownish-flavate; antennæ piceous, pale at the tip; pubescence almost absent anteriorly, moderately sparse and fine on the elytra, somewhat dense on the abdomen; integuments polished. *Head* moderate, distinctly longer than wide; base truncate in the middle, angles rather narrowly rounded, sides parallel and very feebly arcuate; vertex moderately produced, truncate at apex, feebly arcuate in the middle; punctures feeble, small and rather sparse; median line rather broad, equal throughout; antennæ distinctly shorter than the head and prothorax together; basal joint distinctly longer than the next two combined, second slightly shorter than the third, sub-equal to the fourth. *Prothorax* fully as long as wide, equal in width to the head; sides excessively feebly convergent posteriorly throughout and very feebly arcuate; base broadly sub-truncate in the middle; apex broadly, rather feebly and equally strongly arcuate; nuchal sinuation feeble, two-fifths as wide as the disk; anterior angles rather narrowly rounded, basal broadly so; disk transversely, evenly and moderately convex, very feebly, finely and rather sparsely punctate in the middle, more closely so at the sides; median impunctate area moderate in width, even throughout, not impressed. *Elytra* at base slightly wider than the pronotum; sides parallel and feebly arcuate; together broadly, roundly and rather feebly sinuate behind; disk less than one-third longer than the pronotum, one-fourth longer than wide, feebly and narrowly impressed along the slightly elevated suture, finely, feebly, evenly, sub-asperately and rather sparsely punctate. *Abdomen* slender, scarcely narrower than the elytra; sides straight and parallel; surface minutely, very densely, sub-asperately and evenly punctate. *Legs* rather slender; first joint of the posterior tarsi one-third longer than the second, much shorter than the fifth; anterior tarsi slightly dilated. Length 4.2 mm.

San Francisco, 1 ♀.

This species, though closely allied to the preceding, differs from it in such an assemblage of minor characters as to leave very little doubt of its distinctness; among these are its more slender form, still more slender prothorax, and more particularly the elytral punctuation which is decidedly more sparse, feebler and less rugulose; the abdomen also is not pale at tip, and the elytra are paler in color in *luctuosa*.

20—*L. retrusa* n. sp.—Moderately robust; head, pronotum and abdomen throughout black; elytra dark rufo-piceous, scarcely perceptibly and gradually paler toward the apices; legs rather pale brownish; antennæ, labrum and palpi piceous-black, the former slightly paler toward tip; pubescence sparse anteriorly, rather dense and very fine on the elytra, twice as dense, very short and fine on the abdomen, not very conspicuous; integuments polished. *Head* moderate; base broadly and distinctly arcuate, angles very broadly rounded; sides behind the eyes rather short, parallel and nearly straight; surface slightly longer than wide, finely, extremely feebly and rather densely punctate; median line rather broad; epistoma very short, rather narrow, truncate at apex; labrum moderate, teeth small, approximate, rather long and very acute; antennæ nearly as long as the head and prothorax together, second joint distinctly shorter than the third, slightly longer than the fourth. *Prothorax* rather large, quadrate, just visibly wider than the head; sides parallel and nearly straight; base broadly, very evenly and rather strongly arcuate throughout; apex feebly arcuate; nuchal emargination two-fifths as wide as the disk, broadly and distinctly rounded; apical angles rather narrowly rounded, basal scarcely more broadly so, very obtuse; disk very finely margined along the base, broadly, nearly evenly and moderately convex, very minutely, feebly and sparsely punctate in the middle, twice as densely, but still rather sparsely so at the sides; median line rather broad, equal throughout. *Elytra* at base distinctly wider than the pronotum; sides nearly parallel, feebly arcuate posteriorly; together broadly, roundly and distinctly sinuate behind; disk one-fifth longer than wide, one-third longer than the pronotum, rather broadly and strongly impressed along the slightly elevated suture, more distinctly impressed near the scutellum, very finely, rather feebly and very densely punctate; punctures sub-asperate and distinctly finer and denser toward the apex. *Abdomen* very slightly narrower than the elytra; sides parallel and very nearly straight; surface very minutely, evenly, excessively densely feebly and sub-asperately punctate. *Legs* rather slender; first joint of the posterior tarsi one-fourth longer than the second, much shorter than the fifth; anterior tarsi very slightly dilated; posterior tibiae obliquely and feebly excavated exteriorly at the apex, the excavation being smooth and glabrous, and bounded internally by a dense row of closely-placed and very fine erect spinules. Length 4.1-4.3 mm.

Mendocino Co. (Anderson Val.), 5.

This very distinct species may be recognized immediately by its rather narrow head, broadly rounded behind, and having the basal angles almost obsolete. The type is a male; the fifth segment is broadly emarginate almost throughout its width at apex, the sides of the notch being very strongly convergent and distinctly incurvate, each bearing a porrected fringe of nine robust, black, short and rather closely-placed spinules; the porrected process at the bottom of the emargination is very short and rather narrow, scarcely wider than the fimbriate sides; it is broadly and feebly sinuate at apex; sixth segment parabolically emarginate at tip, the notch being slightly wider than deep, exterior angles narrowly rounded; seventh narrowly and acutely incised or divided along its lower surface as in the preceding species.

The structure of the posterior tibiae is peculiar to the genus as far as I have observed.

21—*L. gregalis* n. sp.—Moderately slender, black, abdomen scarcely paler at tip; elytra slightly piceous; legs dark castaneous, tibiae toward tip and tarsi paler; antennae piceous-black at base, fuscous in the middle, testaceous at tip; pubescence sparse anteriorly, rather long, dense and coarse on the elytra, very fine, dense and short on the abdomen, not conspicuous; integuments polished. *Head* rather large, as wide as long; base broadly and feebly arcuate, angles broadly rounded; sides parallel and distinctly arcuate; epistoma broad, moderately produced, truncate; antennal tuberculations small, rather prominent; labrum moderate, teeth slightly deflexed, small, equilatero-triangular, antennae distinctly shorter than the head and prothorax together, second joint slightly shorter and distinctly more robust than the third, distinctly longer than the fourth; surface rather strongly convex, finely, very feebly and densely punctate; median line rather wide. *Prothorax* moderate, slightly longer than wide, very slightly narrower than the head; sides parallel, nearly straight in the middle; base broadly and feebly arcuate, broadly sub-truncate in the middle; apex strongly and evenly arcuate at the sides; nuchal emargination narrow, not one-third as wide as the disk, rather strongly incurvate; apical angles very broadly rounded, basal slightly more broadly so; disk transversely and moderately convex, very finely margined along the base, rather coarsely, very sparsely and excessively feebly punctate in the middle, much more finely, distinctly and densely so at the sides; median impunctate area rather broad. *Elytra* at base very slightly wider than the pronotum, scarcely wider than the head; sides very slightly divergent posteriorly and very feebly arcuate; together broadly, roundly and very feebly sinuate behind; disk one-fourth longer than wide, one-third

longer than the pronotum, very feebly convex, very broadly and feebly impressed along the very slightly elevated suture, finely, rather strongly and densely, sub-asperately and evenly punctate. *Abdomen* at base nearly as wide as the elytra; sides parallel and very feebly arcuate; surface very finely, sub-asperately and densely punctate. *Legs* slender; anterior tarsi very slightly dilated; first joint of the posterior nearly one-half longer than the second, sub-equal in length to the fifth. Length 3.5 mm.

Santa Clara Co, 11.

The type is a male, the sexual characters being of the same general order as in the preceding group of species, although distinctly modified; the fifth segment is broadly and rather feebly emarginate nearly throughout its width at apex, the sides of the notch being very strongly convergent and feebly incurvate, each having a porrected fringe of about thirteen robust, closely-placed spinules; the median porrected process is very narrow, about one-half as wide as the fimbriate sides, and exceedingly short, with the sides acute and not broadly rounded as in the preceding species; it is broadly, roundly and rather strongly emarginate throughout its width at apex, and has its surface smooth, glabrous and conically impressed; sixth segment broadly and parabolically emarginate at apex, the notch being twice as wide as deep, and having the edge at the bottom narrowly membranous; seventh segment broadly divided.

22—*L. mimula* n. sp.—Form rather slender, intense black throughout except the abdomen at tip which is slightly paler; legs rather dark brownish-flavate; antennæ black at base, becoming dark fuscous toward tip; pubescence very sparse anteriorly, long, coarse and rather sparse on the elytra, very fine and moderately dense on the abdomen; integuments polished. *Head* moderate; base truncate, angles rather narrowly rounded; sides parallel and nearly straight; surface scarcely as wide as long, moderately convex, very finely, moderately feebly and rather densely punctate; median line rather broad; epistoma moderate in width, slightly produced, broadly and feebly arcuate at the apex; antennal tuberculations small, rather prominent; labrum moderate in size, teeth broader than long, scarcely deflexed, distinct; antennæ slightly shorter than the head and prothorax together, basal joint rather robust. *Prothorax* scarcely perceptibly narrower than the head, slightly longer than wide; sides parallel, straight or very feebly sub-sinuate in the middle; base broadly and feebly arcuate, broadly sub-truncate in the middle; apex strongly

arcuate at the sides; nuchal emargination one-third as wide as the disk, strongly and evenly incurvate; anterior angles rather broadly rounded, basal slightly more broadly so; disk very evenly, moderately and transversely convex, punctured as in *gregalis*. *Elytra* at base distinctly wider than the prothorax and slightly wider than the head; sides nearly parallel, feebly arcuate; together broadly, roundly and moderately sinuate behind; disk scarcely perceptibly impressed along the very slightly elevated suture, one-fourth longer than wide, nearly one-half longer than the pronotum, finely, feebly, sub-asperately, evenly and not densely punctate. *Abdomen* rather narrow, at base distinctly narrower than the elytra; sides parallel and feebly arcuate; surface finely, feebly, sub-asperately and densely punctate. *Legs* slender; first joint of the posterior tarsi one-third longer than the second, distinctly shorter than the fifth. Length 3.3 mm.

Santa Cruz Co., 5; Santa Clara Co., 3; San Mateo Co., 3.

Described from the male; the fifth segment is broadly and feebly emarginate at apex, the sides of the emargination being extremely strongly convergent and feebly incurvate, each having a fringe of nine closely-placed spinules; the median process is very short, fully as wide as the fimbriate sides, its lateral extremities being in the form of strong acute porrected teeth, and having the apex broadly roundly and strongly emarginate throughout its width, its surface being scarcely perceptibly impressed; the remaining segments modified nearly as in *gregalis*. The species resembles the preceding to such an extent that great care is requisite in its identification; it is, however, distinguishable by its narrower head with straighter sides and much more narrowly rounded basal angles, by its longer elytra, which are also decidedly more sparsely and feebly punctate, and by its sexual characters. The pronotum and elytra are sometimes paler perhaps from immaturity.

23—*L. languida* n. sp.—Form rather slender, depressed; head black; abdomen piceous, slightly paler at tip; pronotum dark rufo-fuscous; sides and apex of the elytra broadly pale brownish-flavate, central and basal portions shaded darker, castaneous; legs pale flavate throughout; antennæ piceous-black at base, becoming gradually rather pale testaceous toward the apex; pubescence of the elytra and abdomen not very dense, fine and inconspicuous. *Head* nearly as wide as long; base truncate in the middle, angles moderately broadly rounded; sides parallel and nearly straight; surface moderately convex, rather

coarsely, very feebly and somewhat sparsely punctate; median line broad; epistoma moderately produced, broadly and feebly arcuate at apex; antennal tuberculations feeble, not prominent; antennæ nearly as long as the head and prothorax together, second joint slightly shorter than the third and much longer than the fourth, not very robust, third three times as long as wide. *Prothorax* just perceptibly narrower than the head, very slightly longer than wide; sides parallel, nearly straight in the middle; base and apex broadly, nearly evenly and rather strongly arcuate, the latter very slightly the more strongly so; nuchal emargination much more than one-third as wide as the disk, broadly and very feebly incurvate; anterior and posterior angles broadly and nearly equally rounded; disk broadly and rather feebly convex, rather coarsely, sparsely and excessively feebly punctate in the middle, the punctures becoming finer, more distinct and denser toward the sides; median impunctate area rather broad. *Elytra* at base distinctly wider than the prothorax, slightly wider than the head; sides parallel, feebly and nearly evenly arcuate; together broadly, roundly and moderately sinuate behind; disk one-fourth longer than wide and one-third longer than the pronotum, rather coarsely, densely, evenly and sub-asperately punctate. *Abdomen* at base distinctly narrower than the elytra; sides parallel and nearly straight; surface very minutely, feebly, densely and sub-asperately punctate; border rather narrow and deep, slightly paler in color. *Legs* slender; first joint of the posterior tarsi one-half longer than the second, sub-equal in length to the fifth. Length 4.0 mm.

Sonoma Co., 1 ♂.

Resembles the preceding two species in its elongate prothorax, but possessing a still different modification of the male sexual characters. The fifth segment is broadly emarginate nearly throughout its width at apex, the sides of the emargination being feebly convergent and nearly straight, each having a porrected fringe of seven rather widely-spaced spinules; the median process is very short and broad, being twice as wide as either of the fimbriate sides adjoining; it is broadly, feebly and evenly arcuate throughout its width at apex, and without any appearance of lateral teeth; sixth segment strongly and parabolically emarginate at apex, the notch being nearly one-half wider than deep.

METAXYODONTA n. gen.

In this genus, represented by two closely-allied species, the form and general appearance again differ most

decidedly from anything hitherto described; the head is small, triangular, with very large, coarsely granulated eyes, robust antennæ and with an entirely different structure of the labrum. The species are rather robust, and the integuments throughout are strongly alutaceous, this appearance being produced upon some portions of the body by an excessively minute and dense punctuation, and upon others by a correspondingly minute and dense granulation. The head in both of the forms here described is blackish, the remainder of the body, legs, labrum and antennæ being flavate or clouded slightly with brownish; they are very rare although the species may perhaps be relatively more numerous.

24—*M. alutacea* n. sp.—Rather robust; head fusco-castaneous or nearly piceous-black; pronotum and abdomen concolorous, pale castaneous; elytra still paler, brownish-testaceous; legs uniformly flavate; antennæ uniformly pale reddish-flavate throughout; palpi flavate; pubescence fine, moderately dense, coarser and more conspicuous on the elytra; integuments alutaceous. *Head* moderate, as wide as long; sides parallel, short and distinctly arcuate; base truncate, angles broadly rounded; eyes very large, at scarcely their own lengths from the basal angles, not prominent, rather coarsely granulate; epistoma rather strongly produced, sides strongly convergent toward the apex, truncate anteriorly; antennal tuberculations rather strong, small; surface moderately convex, extremely minutely and densely punctate, with a very narrow median impunctate line, having two widely distant, annular, setigerous punctures between the eyes and one behind each antennal tuberculation, also several small ones near and behind the eyes; antennæ rather robust, slightly longer than the head and prothorax together, basal joint about three times as long as wide, second two-thirds as long as the third, nearly as long as the fourth, joints four to ten decreasing in length, the latter scarcely as wide as long, eleventh ovoidal, obtusely acuminate, much shorter than the two preceding together. *Prothorax* very slightly wider than long, sub-equal in width to the head; sides very feebly convergent from apex to base, the latter narrowly truncate in the middle; apex broadly and rather feebly arcuate, narrowly and feebly sinuate in the middle; apical and basal angles equally and very broadly rounded; disk transversely and very feebly convex, extremely minutely and densely punctate; punctures slightly more sparse near the middle, where there is a very narrow and obscure median impunctate line. *Elytra* at base very slightly wider than the pronotum; sides nearly parallel, very slightly arcuate; together broadly and feebly sinuate at apex; outer angles rounded; disk quadrate, one-fourth longer than the pronotum, feebly convex, feebly impressed on the suture toward base, the suture not elevated, very minutely, evenly and densely granulose; the granulations

separated by more than their own widths and setigerous. *Abdomen* rather robust, nearly as wide as the elytra; border moderate; surface very minutely, feebly, densely and sub-asperately punctate, the asperities being arranged in very close, interrupted, transverse wavy lines. *Legs* moderate; anterior tarsi distinctly dilated, fourth joint slightly emarginate, first four joints of the posterior tarsi decreasing uniformly and very gradually in length, the first less than one-half longer than the second and much shorter than the fifth, fourth longer than wide. Length 3.8 mm.

Santa Clara Co., 1 ♂.

The fifth ventral segment is thickened in the middle third at apex, the edge being obliquely beveled and having a dense comb-like row of very minute, parallel, longitudinal black ridges or strigæ; sixth segment broadly and very strongly emarginate at apex, the emargination acutely rounded anteriorly and having at each side, slightly distant from the edge of the notch and at about the middle of its length, a small brush of very long densely-placed hairs; seventh segment very narrowly divided, truncate at tip, large and prominent.

25—*M. quadricollis* n. sp.—Form rather robust; head piceous-black; pronotum and elytra pale rufo-testaceous, the latter slightly the paler; abdomen pale brownish-fuscous; legs, antennæ, labrum and palpi concolorous, very pale flavate; pubescence sparse anteriorly, coarser, much denser and not very conspicuous on the elytra and abdomen, distinctly denser on the latter; integuments alutaceous. *Head* moderate, as wide as long; sides short, parallel; base truncate, angles rather broadly rounded and slightly prominent; surface moderately and evenly convex, extremely minutely and densely punctate, with a very narrow median line which is totally obliterated anteriorly; antennæ rather robust, as long as the head and prothorax together, second joint three-fourths as long as the third. *Prothorax* nearly quadrate; sides parallel and feebly arcuate; base broadly and rather feebly arcuate; apex broadly arcuate, very feebly and roundly emarginate in the middle third, with the edge at each side just without the emargination slightly sinuate; apical angles very narrowly rounded, basal broadly so; disk distinctly longer than the head, exclusive of the labrum, and very slightly wider, broadly and rather feebly convex, excessively minutely and densely punctate; punctures noticeably sparser toward the middle, where there is a very narrow imperfect impunctate line, and, near the base, a short median stria. *Elytra* very slightly wider than the pronotum; sides parallel and slightly arcuate; together broadly and extremely feebly sinuate at apex; disk slightly longer than wide, scarcely one-fourth longer than the pronotum, very mi-

nutely and densely granulate. *Abdomen* slightly narrower than the elytra; sides nearly parallel; surface minutely, densely and sub-asperately punctate, without any arrangement in wavy rows. *Legs* moderate; anterior tarsi moderately dilated; first four joints of the posterior decreasing uniformly and very gradually in length, the first one-half longer than the second and shorter than the fifth. Length 3.8 mm.

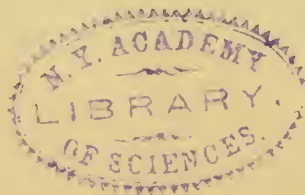
Lake Co., 1 ♂ (Mr. Fuchs).

This species is rather closely allied to the preceding, the sexual characters being almost identical, the surface of the fifth segment being slightly more strongly swollen in the middle near the apex and the notch of the sixth being very slightly more broadly rounded in *quadricollis*; in the form and size of the pronotum, relative length of the elytra, and in the punctuation of the abdomen, the two species are, however, so distinct that it can scarcely be possible to confound them.

The eastern *Lithocharis corticina* Grav. is somewhat allied to this genus, but is scarcely congeneric. The labrum in *corticina* is very large, broadly explanate and rounded at the sides; in the middle of its apical margin it has a small abrupt emargination, at the bottom of which there is an obtuse tooth which is the prolongation of a small anterior dorsal carina. In the general form of the head it is strikingly different from the members of *Metaxyodonta*.

L. confluens Say must form the type of a genus quite distinct from any other here described, because of the very different structure of the posterior tarsi which are short and rather robust, and in which the basal joint is slightly shorter than the second and less than one-half as long as the fifth. For this genus I would propose the name *Trachysectus*.

I am indebted to Dr. J. Hamilton of Allegheny and Mr. F. M. Webster of Lafayette, Indiana, for specimens of these species.



APPENDIX.

I.

HESPEROBIUM n. gen. (Pæderini).

It is not without great diffidence that I here propose a new name for the American species which have been hitherto placed in *Cryptobium*; especially is this the case since the South American and Mexican species have been passed over almost in silence regarding their generic distinctness by Dr. Sharp, and the North American forms, first by Dr. LeConte and afterwards, independently, by Dr. Horn. Being moved, however, by the conviction that scientific nomenclature has arrived at such a stage that to longer abstain from recognizing and differentiating distinct generic subdivisions, can only be conducive to a superficial knowledge of nature and be detrimental to a scientific arrangement of the species as a whole, I have concluded to make the division and give the differential descriptions in the form of parallel columns, by which means the chief distinctive features can be more readily compared.

In the following statement the type of *Hesperobium* is the Californian *H. tumidum* Lec., the characters of *Cryptobium* Mann. being taken from the very thorough treatise by Mr. C. Rey upon the Pæderini (Hist. Nat. Col. Fr., 1878).

CRYPTOBIUM.

Labrum short, sinuate and bidentate in the middle of its anterior margin.

HESPEROBIUM.

Labrum very short and broad, feebly and triangularly emarginate throughout its width at apex, not denticulate but having in the middle, at the apex of the triangular notch a small rounded emargination; sides strongly convergent toward the base; apical angles narrowly rounded.

Third joint of the maxillary palpi gradually and rather strongly dilated toward the apex which is truncate; fourth small, slender and subulate.

Labial palpi short with the two basal joints sub-cylindrical, the second a little longer than the first; the third small, slender, acuminate.

Paraglossæ acuminate.

Antennæ having the second and third joints sub-equal.

There are also differences in the structure of the abdomen, and in the relative sizes of the segments.

Except in the characters given above, the two genera are somewhat similar. In applying these to the entire group of North American species, it is easily seen that the antennal structure is not entirely constant, there being a few species in which the second and third joints are nearly equal in length. The components of a very limited group of small species containing *pusillum*, *lepidum*, etc., have the fourth joint of the maxillary palpi small, acicular and not conical, and those should probably be referred to a closely-allied genus or to a sub-genus; all the others have the fourth joint conical and pointed, although varying greatly in thickness at the base², all being, however, variations of one common type, which is the *conical and acutely pointed*. Dr. Sharp

Third joint long and slender, rather feebly dilated, obconical; fourth short, slightly oblique, conical, acutely pointed, nearly as wide at base as the apex of the third and received partly within it.

Labial palpi slender, first joint longer than wide, about one-half as long as the second, which is slender and more or less dilated at the apex; third conical, very slender, acute, much narrower at base than the apex of the second.

Paraglossæ elliptically rounded at tip.

Antennæ with the second joint distinctly shorter than the third.

¹ LeConte—Proc. Amer. Phil. Soc. XVII, 1878, p. 392.

² The two species, *convergens* and *parallelum*, described by me (Cont. II, pp. 129-131), and very erroneously united by Dr. Horn (Ent. Amer. I, p. 109) under the head of an entirely distinct species—*floridanum*—serve as a good illustration of this variability of the fourth joint, this being conical and very narrow, small and almost acicular in *convergens*, and scarcely longer than wide, being strongly conical, flattened and almost as broad at base as the apex of the third in *parallelum*. Having here incidentally made a correction

(Biol. Cent.-Amer., I, Pt 2, p. 506), probably because of this variability, considers the palpal structure as of minor importance when compared with others, and does not even employ it in subdividing the genus, although this has been done with more or less success by Dr. Le Conte (Proc. Am. Phil. Soc. XVII, 1878, p. 390), but without considering the structure of the maxillary palpi, we still have, I think, enough characters remaining to confirm the validity of *Hesperobium*.

Dr. Sharp, in the work above mentioned, divides the Central American species into groups depending upon the presence or absence of a lateral raised line upon the lower part of the flank of each elytron; when the *Pæderini* have been sufficiently studied as a group, it may be found desirable to give this character a generic import, in which case the name *Hesperobium* should be retained for the species having this lateral line, as it is present in the type which is assumed above as representing the genus. It is also present in *californicum*, and in an undescribed species, represented in my cabinet by a unique male, found near San Francisco; it is probably characteristic of the Californian species as a group³.

In describing several species of this genus (Cont. II, pp. 127-133), attention was called to two very large and prominent annular punctures, or more properly areolæ, situated behind the eyes. I think that these punctures are of greater importance from a systematic standpoint than was at first supposed, as they constitute one of the distinguishing features of *Hesperobium* and the American species of *Lathro-*

in synonymy, I take the present opportunity to say in addition, that it is very difficult to reconcile Dr. Horn's assertion regarding the mutual identity of my *H. capito* and *H. pallipes*, Grav., with the statement made by Erichson in the description of the latter, viz: "Thorax latitudine sesqui fere longior." The prothorax in *capito* is "scarcely one-fifth longer than wide." (Cont. II, p. 128.)

³ This line is also well developed in the Californian species which have been referred to *Lathrobium* and which are probably generically distinct.

bium, being absent in the latter genus. In *Hesperobium californicum* they are very large, slightly oval, strongly annular and crater-like, occupying the entire summits of slight elevations, and having their planes not exactly parallel to the general surface but tilted very slightly forward, so that the slope of the elevation is more prominent behind. Between them the surface is narrowly elevated or tumid in a longitudinal direction, and from the middle of each arises a very long erect seta from an annular median tubercle, which corresponds to the cone of the crater. These most singular structures are probably an additional distinctive feature of *Hesperobium*.

The genus *Homæotarsus* founded by Hochuth upon an Armenian species, does not concern us at the present time, as, although the maxillary palpi are apparently of like structure, it is, in almost all other respects, entirely similar to *Cryptobium* (Lac. Gen. Col. II, p. 90).

II.

In the first volume of this Bulletin, page 315, I stated that the mandibles in *Orus* were quadridentate within. This is true only of the right mandible. Since the publication of the paper referred to, I have examined the left mandible and find it tridentate, the three teeth being small, approximate and situated almost exactly in the middle of the inner margin; the two basal ones are erect, slightly longer than wide, acute and equal, the third being longer and more slender, acute and rather strongly inclined toward the apex, the latter being evenly and strongly arcuate, very acute and slender. This combination of four teeth in the right and three in the left mandible is of frequent occurrence in the portion of the *Pæderini* near and related to *Lithocharis*, where the mandibular characters appear to lose the importance which they possess in some other portions of the group. The abnormal arrangement of the teeth in *Orus* therefore, although it cannot of itself be maintained as a generic character, still serves to

show that which may easily be inferred from its general appearance, viz: that it is much more nearly related to Lithocharis and its allies than it is to Scopæus. It should, in fact, in a systematic arrangement of our Pæderini, immediately precede Caloderma which it resembles in its 4-dentate labrum, and from which it is distinguished, as before remarked, by its strongly inflated third maxillary palpal joint, and also by its elongate prothorax and short basal joint of the posterior tarsi.

III.

A considerable number of new genera having been described since the publication of the Classification of the Coleoptera of North America by LeConte and Horn, I would propose the following as a substitute for the one given in that work, page 99, for those Pæderi which have the fourth tarsal joint simple.

It will be noticed that, in the following table, the geniculation of the antennæ is considered of secondary importance when compared with other characters. Although this geniculation varies greatly in amount, I have yet failed to observe a single species of North American Pæderini in which it is not more or less manifest; the character is therefore merely one of degree and is only of importance when present in its extremes. There is, however, a marked difference in the nature of the geniculation. In Hesperobium, and probably also Ababactus, the deep emargination at the apex of the scape which receives the second joint when flexed, is at the anterior portion of the apex, so that the funicle is bent to the front, while in the second section this emargination is at the back of the apex, so that when flexed the funicle projects posteriorly. It is also to be noted that the geniculation of the antennæ prevailing in the Pæderini is not like that to be seen in some other groups of Coleoptera, where the second joint is placed almost immovably at an angle with the scape, and which could appropriately be termed *rigidly geniculate*. In this group the funicle is

capable of being flexed or straightened at pleasure, and, in contradistinction to the former, such an antenna might be called *flexibly geniculate*.

Basal joint of the antennæ greatly elongated, sub-equal in length to the next three or four together; antennæ strongly and anteriorly geniculate.

Neck broad..... **Hesperobium.**

Neck narrow..... **Ababactus.**

Basal joint of the antennæ not greatly elongated; antennæ posteriorly and more or less strongly geniculate.

First four joints of the posterior tarsi sub-equal, first not longer than the second.

Neck rather broad.

Prothorax sub-quadrate or slightly elongate; labrum bilobed

Lathrobium.

Prothorax narrowed from apex to base; labrum truncate, not denticulate, having along the lower edge of its anterior margin four widely-spaced, very short, broadly rounded callosities, and, in the middle a very small, rounded emargination..... **Trachysectus.**

Neck very slender.

Prothorax gradually narrowed anteriorly; labrum quadridentate.

Scopæus.

Hind tarsi with the first four joints decreasing more or less gradually in length.

Prothorax narrowed in front.

Labrum quadridentate..... **Echiaster.**

Labrum bidentate..... **Stilicus.**

Prothorax sub-quadrate, anterior and posterior angles more or less narrowly rounded.

Labrum having four rather large sub-equal teeth; elytra much longer than the pronotum.

First joint of the posterior tarsi very slightly longer than the second.

Orus.

First joint of the posterior tarsi sub-equal in length to the next two together..... **Caloderma.**

Labrum with two pairs of minute approximate teeth; elytra no longer than the pronotum..... **Oligopterus.**

Labrum bidentate; elytra variable in length..... **Lithocharis.**

Labrum unidentate; elytra longer than the pronotum. **Metaxyodonta.**

Labrum rounded; acutely emarginate at tip; elytra as long as the pronotum..... **Dacnochilus.**

Labrum entire; elytra shorter than the pronotum... **Liparocephalus.**

IV.

THYCE Lec.

The following species was recently announced by me under the generic name *Polyphylla* (Bull. Cal. Acad. Sci., I, p. 235). The genus *Thyce*, although resembling *Polyphylla* very greatly, differs radically in antennal structure, the club being trifoliate and the joints of the funicle of nearly equal length; while in *Polyphylla* the greatly developed third joint is a very prominent distinctive feature, in addition to the more complex club.

In *T. marginata* the anterior tibiæ have two teeth exclusive of the exterior apical spur which is very pronounced; these teeth are very unequal, the one nearer the base being very short and obtuse. The males have a large and rather feeble impression in the middle of the abdomen near the base. I have not seen the female.

T. marginata n. sp.—Form moderately robust; sides distinctly arcuate; prothorax piceous; elytra rufo-fuscous; the former having three posteriorly divergent lines of whitish squamose pubescence, the exterior ones widest and interrupted in the middle, the median very fine and almost obsolete toward base; each elytron having along the exterior edge a very wide line of plumbeo-cinereous and very slender squamose pubescence, not very densely placed, which is recurved at the apex continuing thence along the suture as a narrow, whiter and much better defined line to the base; between these there is another very fine line terminating at one-fifth the length from the apex; pubescence elsewhere fine and very sparse; legs and antennæ fuscous; each ventral segment having an irregular spot of whitish squamiform pubescence at each side next the elytra. *Head* excluding the eyes slightly longer than wide, sub-quadrate; clypens moderately reflexed, broadly and feebly sinuate anteriorly; angles right and not at all rounded; pubescence long, rather sparse, mixed with squamose hairs near the base and sides; antennæ well developed, funicle two-thirds as long as the club and nearly as long as the head, club viewed upon the broad side slightly wider at apex than at base, three and one-half times as long as wide. *Prothorax* widest at the middle of its median length where it is four-fifths wider than long; sides thence strongly convergent and feebly arcuate to the apical angles, feebly convergent and straight to the basal angles which are obtuse and slightly rounded; base broadly angulate, feebly sinuate toward each basal angle; disk strongly convex, rather finely, moderately densely and irregularly punctate; punctures round, very shallow, variolate. *Elytra* at base slightly wider than the prothorax; sides parallel and feebly arcuate; together slightly less than one-half

longer than wide, two and one-half times as long as the prothorax, very finely, sparsely, feebly and irregularly punctate; punctures asperate. Pygidium wider than long, feebly convex, finely and rather sparsely punctate, moderately sparsely and evenly covered with short slender squamose pubescence. Posterior tarsi short, two-thirds as long as the tibiae; claws moderate, having a small erect acute tooth interiorly near the base. Length 19.0 mm.; width 8.5 mm.

California (San Diego Co.), also probably Lower California.

Five or six specimens were taken by Mr. G. W. Dunn, and I have received the present specimen through the kindness of Mr. W. G. W. Harford.

This species differs from *squamicollis*, Lec. in almost every character given by Dr. LeConte in the original description of the latter (Journ. Phil. Acad. III, Nov. 1856, p. 225). It may, however, perhaps be best to call special attention to the more salient differences. These are the size, *squamicollis* being one-third longer, and the form and vestiture of the head and prothorax, the latter in *marginata*, having no sign of a median channel, with the surface not impressed toward the anterior angles, and having the punctuation extremely sparse near the sides of the pronotal disk. The scutellum in *marginata* has no glabrous line, and the pygidium is rather sparsely squamose. If *squamicollis* possessed three prominent lines of scales upon the pronotum, with the surface elsewhere almost entirely free from them, or if it had three distinct lines of slightly denser pubescence upon each elytron, it is to be presumed that such striking characters would have been mentioned by Dr. LeConte; this purely negative evidence alone, therefore, is almost conclusive proof of the specific distinctness of *marginata* and of its validity.

V.

ERRATA.

Several errors occurring in the paper published by me in the preceding volume of this Bulletin require correction, as follows:

Page 299—3th line from bottom, for "Colodera" read "Calodera."

Page 311—1st line of descr., for "L. longipennis" read "V. longipennis."

Page 327—10th and 15th lines from top, for "Horniarum" read "Hornianum."

STUDIES IN THE BOTANY OF CALIFORNIA AND PARTS
ADJACENT.

BY EDWARD LEE GREENE.

IV.

1. *On Some Chicoriaceous Compositæ.*

The type of the genus *Microseris*, Don, is a South American plant, and we have no North American species which agree with it in both habit and pappus. It has ten awn-tipped paleæ; the Californian species which seem truly congeneric with it, have five only. These species of the northern hemisphere are about seven or eight in number, and agree in aspect perfectly with their type. They are acaulescent annuals, with rosulate-depressed leaves, slender scapes, which are always decumbent at base, never at all thickened above, supporting heads which are uniformly nodding, both before and after flowering, becoming for the second time erect at the maturity of the fruit.

The name *Calais*, DC. appears to be but in part synonymous with *Microseris*. DeCandolle himself thought it might eventually be shown that he had included under *Calais* the types of two genera; and I am persuaded fully that his § *Calocalais* is a real genus, distinct from *Microseris*. The species are few. Their paleæ are five, but the awn rises from an apical notch. These plants are never really acaulescent. Their leaves are ascending, or erect, on the short or long stems. The peduncles are stout, strictly erect, thicker above, and the heads are firmly erect at all stages of growth. Of this peculiar aspect and character there are about five species, four of which have already their suitable names under *Calais*.

Scorzonella, was thirty years ago reduced by Dr. Gray to *Calais*. Bentham and Hooker, in the *Genera Plantarum*, while reducing the whole of DeCandolle's *Calais* to *Microseris*, in recognition of the priority of the latter name, nevertheless perceived the validity of *Scorzonella* as a genus, and restored it; but in the *Synoptical Flora*, as well as antecedently, in volume nine of the proceedings of the American Academy, it reappears as a mere section of *Microseris*. Having studied these plants diligently on their native soil during some six or seven years, I can but agree with the able and experienced founder of the genus, and with the learned authors of the *Genera Plantarum*, that *Scorzonella* should stand. Here the pappus-bristles are somewhat indefinite in number, and are mostly real bristles with paleaceous-dilated base, rather than awn-tipped paleæ. The plants, while caulescent like *Calais*, have nodding heads like *Microseris*, quite distinctive involucre, fusiform perennial roots, and are æstival in flowering; whereas the two kindred genera of annuals have but a very short and strictly vernal season of flowering and fruiting. April is their month, and it is usually in vain to look for them after the beginning of May.

There are some three species of this particular alliance, upon which the eminent author aforementioned in the *Plantæ Fendlerianæ* established a genus *Ptilophora*, concerning which I judge all to have been well, save that the name was already in use for a genus of sea-weeds. These plants, while wholly in keeping with *Scorzonella*, as regards their general aspect, and perennial root, have a pappus of quite different character. The only distinction which has hitherto been definitely stated is that the numerous bristles are white and soft-plumose. This is doubtless the most obvious, indeed it may be the only difference noticeable at first sight, in the very best of herbarium specimens, unless it be this, that the texture of the pappus is not only soft, but very fragile, which is not true of that of any *Scorzonella*. Now,

the field observer, coming in sight of one of these plants in ripe fruit, perceives that these pappus-plumes are not straight and ascending as in all other genera of this group, but that they are regularly and gracefully recurved. This naturally and perfectly developed fruit, just ready to be set afloat in mid air on the jarring or shaking of the parent receptacle, will never be found in herbarium specimens. The nearly ripe heads which partially unfold their pappus after drying, show every character but this important one. It seems to me never to have been spoken of in relation to the large and somewhat varied genus, *Stephanomeria*, where it is universal, and will serve to distinguish between that and its nearest ally, *Rafinesquia*, in which, if my memory serves faithfully, the pappus is straight. Dr. Kellogg must have observed this neat characteristic of the genus in question, when he collected the common species in 1870; and it may well have been this which led him to refer to the plant, with a doubt, to *Stephanomeria*. The quick eye of our venerable pioneer caught at once the new fact, and he unconsciously recorded it in his misnomer. The last peculiar mark of the genus was detected by myself, lately, upon examining the excellent herbarium specimens with which we are now supplied. There are clear traces of a double pappus. I find on about one half of the akenes a solitary, firm, merely scabrous bristle, exterior to the plumose-awned paleæ, and of less than half their length, a kind of character which comes out strongly in another Chicoriaceous genus of California, namely, *Malacothrix*, between which and *Scorzonella* this very clear one ought to be placed. Dr. Gray, a few years subsequently to his founding of *Ptilophora*, having discovered that name to be a synonym, and also having evidently lost somewhat of his faith in the validity of the genus, reduced it to *Calais*; yet with express misgiving, and not without bespeaking for it another generic name in case it should ultimately demand restoration to that rank. Under that very appropriate name, *Ptilocalais*, I propose its reinstatement.

There is a perennial, acaulescent plant of northern habitat which, although admitted by Dr. Gray into his superlatively amplified *Microseris*, is, in my opinion, to be excluded from *Scorzonella*, to which it is more related than to any other recognized genus. The paleæ of its pappus are soft and slender, ending in a sharp, but hardly awn-like point; its involucre has a peculiarity, and the heads are never nodding. The specific name, *troximoides*, was given on account of the close resemblance which the species bears to *Troximon cuspidatum*. But this last-named plant appears to be entirely out of place in *Troximon*; for its pappus is composed, partly of capillary bristles, and partly of very narrow paleæ. My conclusion is, that these two plants will constitute the most perfectly natural genus in the whole group, and I so place them, adopting the name which Dr. Gray coined for sectional use under his *Microseris*.

The form of the akenes in these genera, whether turbinate or cylindrical with truncate apex, or whether more or less attenuate upwards, would seem to be of specific but not generic importance. The basal callosity, although not very seriously taken under consideration by Dr. Gray, appears to have merited more deliberate attention; for, in *Microseris*, as here defined, it manifests a character which runs through all the species, without reappearing in any of the other genera, except that there is a mere hint of it in *Calais*.

The æstivation of the pappus is of one character in all the genera. Whether the paleæ be five, or twice or thrice or four times that number, one^{*} is always wholly exterior, and an opposite one interior, while all the others are regularly convolute. In *Microseris* alone the species fall into two quite natural groups by a difference in the expansion of the individual paleæ.

MICROSERSIS, Don.

Involucre oblong-cylindrical to hemispherical, inner bracts in one or two series, equal, acuminate, thin, with

membranous margins; outer very short, calyculate. Receptacle flat, slightly alveolate. Akenes terete, 8—10-costate, with a broad basal callosity, which is hollowed at the insertion and produced upward into a sharp, denticulate-scabrous, collar-like rim. Paleæ of the pappus 4—10 (usually 5), mostly short, tapering into a long or short scabrous awn, in one species nearly obsolete, the awn thicker but hardly flattened at base. Acaulescent, glabrous annuals, with entire or laciniately lobed on pinnatifid leaves, and nodding heads on slender scapes, which are somewhat decumbent at base and not thickened above. Outer row of akenes commonly silky-villous; the others usually scabrous on the ribs. Paleæ of the pappus often villous exteriorly. Genus of very limited range east and west; not found east of the western base of the Sierra Nevada, but occurring near the coast, from the peninsula of Lower California to Oregon.—*Microseris*, Don. Phil. Mag. xi. 388; Benth. & Hook. ii, 506, magna pro parte: *Microseris* §§ *Eumicroseris* (excl. *M. Forsteri*) & *Eucalais*, Gray, Proc. Am. Acad. ix. 208; § *Eucalais*, Bot. Cal. i. 425, and § *Calais* (excl. sp.), Syn. Fl. ii. 418. *Calais* § *Eucalais*, DC. Prod. vii. 85; *Calais* §§ *Eucalais* and *Aphanocalais*, Gray, Pac. R. Rep. iv. 112.

*Paleæ 5, boat-shaped i. e., a little incurved and the margins involute.

M. PLATYCARPHA, Gray.—A span or more in height; head a half inch or less in length; main bracts of involucre about 8, oblong; akenes turbinate, 2 lines long; paleæ ovate, 2 lines long, tapering abruptly into a very short awn. Syn. Fl. ii, 420.

San Diego County, and on the northern part of the peninsula below.

M. DOUGLASII, Gray, l. c.—A span to two feet high; head about $\frac{3}{4}$ inch long; bracts linear-oblong; akenes oblong-turbinate, contracted under the summit, 3 lines long; paleæ

ovate, 2 lines long, tapering abruptly into an awn of the length of the akenes.

Monterey to Humboldt County. Common and extremely variable as to the villosity of the paleæ and outer row of akenes.

M. PARISHII.—Rather smaller and more slender than the last; akenes slender, strictly columnar, 2 lines long or more, dark brown; paleæ lanceolate, 3 lines long, very gradually tapering to an awn of a line or a line and a half.

Near San Luis Rey, April, 1881, S. B. Parish; near Tulare, 1882, Dr. C. C. Parry; also collected by the writer near San Diego, 1885.

A very distinct species, evidently belonging to the southern part of the State.

M. ATTENUATA, Greene.—A few inches to a foot and a half high; involucre $\frac{1}{2}$ — $\frac{3}{4}$ inch long; akenes 4 lines long, attenuate-fusiform, the narrowed upper half vacant; paleæ oblong-lanceolate, a line and a half long, tipped with an awn of twice that length. Bull. Torr. Club, ix, 111; Gray, l. c., 419.

Near Berkeley, and eastward to the valleys of the Sacramento and San Joaquin.

***Paleæ straight and flat, 5, except in the last species.*

M. ACUMINATA, Greene.—Size and aspect of the last, the heads an inch long; akenes slenderly fusiform-turbinate, 3 lines long; paleæ 4—5 lines long, lanceolate, very gradually tapering to an awn of 2—3 lines. Bull. Torr. Club, x, 88; Gray, l. c.

Same range as the last species, and rather more common.

M. BIGELOVII, Gray, l. c.—A foot in height, more or less: head about a half inch: akenes oblong-turbinate, hardly 2 lines long; paleæ oblong- to ovate-lanceolate, much smaller

than in the preceding species, but variable in length: passing into an awn twice or thrice as long.

Common in the middle coast section of the State: the awn very long in proportion to the palea.

M. ELEGANS, Greene.—A span or more high, slender: head less than a half inch: akenes turbinate, little more than a line long: paleæ ovate-deltoid, a half line long, the slender awn about 2 lines.—Gray, l. c.

From the mesas back of San Diego to the plains east of Mt. Diablo. Seldom collected, but perhaps not very rare.

M. APHANTOCARPHA, Gray, l. c.—Twelve to eighteen inches high, and rather stout: leaves laciniate-toothed or nearly entire, seldom deeply pinnatifid: heads a half inch high, many-flowered, and subglobose: akenes oblong-clavate, hardly 2 lines long: paleæ minute and very broad or nearly obsolete, the bristles very slender and fragile, about 3 lines long.

Common in the region of San Francisco Bay, and extremely variable as to the pappus, which consists often of bristles with thickened, rather than paleaceous base. It is possible that we have here two or three species, but more probably they are mere forms, passing imperceptibly into each other. The leaves are less dissected in this than in any of the others.

M. PYGMÆA, Don.—About a span high: akenes 1—2 lines long, slenderly turbinate: paleæ 10, lanceolate, a line or more long, slightly notched at the apex, and tipped with a somewhat barbellate awn of about 2 lines.—Phil. Mag. xi. 388; Gray, Proc. Am. Acad. ix. 209.

Native of Chili. The North American species which looks most like this type of the genus is *M. Bigelovii*. The principal difference between them is in the number of the paleæ and the slight notch at the apex of those of *M. pygmæa*, which species in that respect only betrays an affinity with the following genus.

CALAIS, DC. sens. restr.

Involucre conical, scarcely calyculate, bracts imbricate, the outer successively shorter, all thin and scarious-margined. Receptacle flat, centrally more or less alveolate-chaffy. Akenes terete, 8—10 costate, the basal callosity not enlarged. Paleæ of the pappus 5, elongated, flat, bifid at apex and short-awned.—Subaculescent annuals, all West North American, with laciniately-lobed or pinnatifid leaves, and erect heads, on strict, erect peduncles which are fistulous-thickened above. Akenes all alike, glabrous, with scabrous costæ. Paleæ of the pappus glabrous and more or less denticulate. Genus of few species but of wider range than the last, the typical species occurring eastward to the borders of Colorado and Texas, and on the Pacific shores, from British Columbia to the island of Guadalupe. *Calais* § *Calocalais* DC. Prod. vii. 85; Torr. & Gray, Fl. N. Am. ii. 471; Gray, Pac. R. Rep. iv. 112. Species of *Microseris*, Gray, Proc. Am. Acad. ix, Bot. Cal. i. and Syn. Fl. ii.

**Paleæ bright, white, soft, deciduous from the nearly black akenes.*

C. LINEARIFOLIA, DC., Prod. l. c.—Species of the widest range, and of much variability as regards the height of the stem and the number of flowers in each head. Sometimes nearly acaulescent, and with very large heads; but around San Diego the stem is slender and often more than a foot high, the heads being few-flowered; but the bright pappus, promptly deciduous from the mature, almost rostrate-attenuate, black akenes readily distinguishes the species in all its forms, whether on Guadalupe or in New Mexico, Washington Territory, or California.

***Paleæ brownish, of firm texture, persistent on the light colored akenes.*

+ Awn of pappus shorter than the palea.

C. LINDLEYI, DC.—Glabrous, a foot or two high: akenes 5—6 lines long, slightly attenuate toward the summit; palea

linear-lanceolate, 4 lines long, the awn very little shorter.—Prod. l. c.; *Microseris*, Gray, l. c.

From San Francisco to San Diego; equally as common as the first species.

C. PARRYI, Gray. Furfuraceous-puberulent, 6—8 inches high: akenes 3 lines long, and not at all attenuate; palea softer than in the last, its awn less than half as long.—Pac. R. Rep. iv. 112; *Microseris*, Gray, l. c.

Common from the plains back of Mt. Diablo to San Diego: easily mistaken for small *C. Lindleyi*; but, on closer inspection, appearing clearly distinct. The fruit is here for the first time described. The species does not appear to have been collected save by Dr. Parry, in a very immature condition, and by the present writer; but it is no rarity in the field.

+ + *Awn of the pappus longer than the palea.*

C. MACROCHÆTA, Gray.—Like *C. Lindleyi* in size and aspect, but akenes shorter and more attenuate at summit; palea short, only a third as long as the awn, and cleft to the middle.—Pl. Fendl, 112; Pac. R. Rep., l. c.

From Oregon to San Diego, but very rarely collected.

C. KELLOGGII.—Also resembling *C. Lindleyi*: akenes 3—4 lines long, attenuate at each end: palea a third the length of the awn, and with a shallow notch.

San Bruno Mountains, near San Francisco, Dr. Kellogg.

SCORZONELLA, Nutt.

Involucre campanulate; bracts herbaceous, imbricated in several series, the inner long-acuminate, the outer successively shorter and acute. Receptacle flat or convex, foveolate or alveolate. Akenes linear, or somewhat turbinate, 8—10-costate or -striate, truncate at summit, the basal callosity acute and not expanded, areola lateral. Pappus of about 10 (in one species 5) ovate or lanceolate paleæ, tipped

with a generally much longer, straight, scabrous or barbelate bristle or awn. Glabrous perennials with fusiform roots, stems mostly leafy at base with laciniate foliage, and long-peduncled heads which are nodding in the bud. Inhabiting wet grassy grounds, chiefly in the mountain districts from middle California to British Columbia, with one species in the high mountains of Australia and New Zealand. Flowering in summer.—Trans. Am. Phil. Soc. vii. 426; Torr. & Gray Fl. ii. 470; Benth. & Hook. Gen. Pl. ii. 533. *Calais* ? § *Scorzonella* & *Anacalais*, Gray, Pac. R. Rep. iv. 113. *Microseris* § *Scorzonella*, Gray, Proc. Am. Acad. ix. 208 and xx. 300, Bot. Cal. i. 424, and Syn. Fl. ii. 417 (excl. *M. Parryi*).

**Caulescent*.—North American species.

S. MEGACEPHALA.—Glaucous, Robust, 2—3 feet high: leaves oblong, acuminate, entire above the middle, laciniate-toothed toward the clasping base, 6—8 inches long: peduncles stout, a foot long: heads hemispherical more than an inch high, 2 inches broad, 200—225-flowered: bracts of the involucre 40 or more, imbricated in 4—5 series, exterior round-ovate, innermost ovate-lanceolate, all (the outer very abruptly) long-acuminate: akenes 2 lines long, somewhat turbinate: pappus brownish and firm, of 5 ovate-lanceolate paleæ a line long, tapering to an awn of 3—4 lines.

Eel River, Mendocino County, 1866, H. N. Bolander, being a part of his number 4737. A single specimen only, differing from the next species, not in habit or general appearance, but remarkably distinct from it in the characters of the involucre, akene and pappus.

S. PROCERA.—Leaves more laciniate: not acuminate: heads narrower, 100—150-flowered: bracts of involucre 25 or more, in 2—3 series, the exterior ovate, innermost ovate-lanceolate, all acuminate: akenes nearly columnar, 3 lines long: pappus brownish, the paleæ 10 (as in all the following) lanceolate, passing into a thrice longer, barbellate

awn.—*Microseris laciniata* var. *procera*, Gray, Proc. Am. Acad. ix. 209 Bot. Cal. i. 424; *Microseris procera*, Syn. Fl. ii. 417.

From Sonoma county to the borders of Oregon.

S. PRATENSIS.—Leafy at base only, the scapose peduncles 2 feet high: leaves linear, lanceolate, long-cuminate, entire, a foot long: heads an inch high and nearly as broad; bracts 16—20 in 3 series, ovate—to lanceolate—acuminate: akenes 2 lines long; pappus white, 4 lines, the triangular-ovate palea $\frac{1}{2}$ line.

Sunny and rather moist meadow lands at Yreka, in the northern part of the State, collected by the writer June 21, 1876, and distributed by him under number 883 as *Microseris laciniata* var. *procera*. It is readily distinguishable from the preceding and the following by its long, scapose peduncles, and narrow, entire, long, slender-pointed foliage.

S. LACINIATA, Nutt.—Stem less robust and more branching and leafy than in the last: leaves pinnately parted, the segments narrowly linear, an inch or more long: heads a half inch high; bracts 16—20, from round-ovate to lanceolate, all abruptly acuminate: akene 2 lines long: pappus white, about 3 lines, the ovate-lanceolate palea less than a line.—Trans. Am. Phil. Soc. P vii, 426: Torr. & Gray, Fl. ii. 470. *Microseris*, Gray, l. c.

Northern borders of California to the confines of British Columbia.

S. LEPTOSEPALA, Nutt., l. c.—Bracts of involucre in 2 distinct series, the ovate outer ones 5 or 6 only, and hardly more than calyculate to the numerous, lanceolate inner ones, akenes, white pappus, etc., in all their parts more elongated than in the last species; foliage less divided, often merely toothed. Torr. and Gray, l. c.; *Microseris*, Gray, l. c.

Same range as *S. laciniata*, from which it differs very obviously in the character of the involucre.

S. BOLANDERI.—A foot or more high; leaves linear-lanceolate, entire or with a few linear lobes; bracts of involucre regularly imbricated in two or three series, all gradually attenuate from a broad base; pappus brownish, 5 lines long, the ovate palea not more than a half line. *Microseris*, Gray, Syn. Fl. ii. 418.

Mendocino and Humboldt counties, and northward.

S. HOWELLII.—Size of the last; leaves with refracted lobes or teeth; heads narrower. 15–20-flowered; akene 3 lines long; pappus white, a half inch, the palea lanceolate and nearly as long as the awn. *Microseris*, Gray, Proc. Am. Acad., xx, 300; Syn. Fl. Suppl., 454.

Southern Oregon, collected only by Mr. Howell.

S. PALUDOSA.—Stems numerous, slender, 2–3 feet high; leaves a foot long and from subentire to laciniate-parted, the segments long and narrow; head an inch high, 50–75-flowered; bracts 20–25, all tapering from a lanceolate base into a long and slender acumination, the outer successively shorter; akene 2 lines long; pappus brownish, the firm lanceolate palea of a line or more passing gradually into a barbellate awn of 4 or 5 lines. *Microseris sylvatica*, var. *Stillmani*, Gray, Bot. Cal., l. c. and Syn. Fl. l. c.

Marshy grounds in the vicinity of Mt. Tamalpais, and in other localities not far from San Francisco Bay. Here described from excellent specimens obtained by Mrs. Curran at Corde Madera, Marin Co. Most distinct from the following.

S. SYLVATICA, Benth.—A foot or two high, mostly simple and monocephalous: head an inch high, 30–40-flowered: bracts broader than in the preceding and more abruptly acuminate: akene $3\frac{1}{2}$ lines long, columnar, the base a little attenuate: pappus sordid, the lanceolate paleæ 5 lines, tapering to a subplumose awn of 3 lines or less.—Pl. Hartw. 320. *Calais*, Gray, Pac. R. Rep. iv. 112. *Microseris*, Gray, l. c. excl. var. *Stillmani*.

From Contra Costa to Colusa Counties, on wooded hills. Leaves commonly laciniate-pinnatifid as in most species.

S. MONTANA.—Resembling the preceding, but stouter, the foliage less deeply laciniate: akene linear-columnar, not narrowed below, 5 lines long: pappus light brown: paleæ linear-lanceolate, truncate or slightly notched at the apex, only 3 lines long, its short-plumose awn a little longer.

Mountains of Kern County above Tehachapi Pass, June, 1884, Mrs. Curran.

A coarser plant than *S. sylvatica*, with very different fruit. The awn though really plumose, does not bring this species into troublesome proximity to *Ptilocalais*, for it is short, straight, and of firm texture.

***Acaulescent*.—South Pacific species.

S. SCAPIGERA.—*Scorzonera scapigera*, Forst. Prod. 91; *Scorzonera Laurencii*, Hook. f. Lond. Journ. vi. 124; *Phylloppappus lanceolatus*, Walp. in Linnæa, xiv. 507; *Microseris Fosteri*, Hook. f. Fl. Nov. Zel. i. and Fl. Tasm. i. 226; Benth. Fl. Aust. iii. 676; Gray, Proc. Am. Acad. ix. 209.

High mountains of Australia and New Zealand. Outer bracts of involucre somewhat calyculate, as in our *S. leptosepala*. More strictly scapose than any of our species, and a smaller plant; commonly less than a foot high.

PTILOCALAIS, (Gray, Pac. R. Rep. iv. 113).

Perennial root, foliage, involucre, receptacle, etc., as in *Scorzonella*. Pappus bright white, soft and fragile, double, namely, of a single short, external bristle, and 15—20 short, truncate or emarginate paleæ, terminating in a long, gracefully recurving, soft-plumose capillary bristle or awn.—*Ptilophora*, Gray, Pl. Fendl. 112. *Calais* § *Ptilophora*, Gray, Pac. R. Rep. l. c.; *Microseris* § *Ptilophora*, Gray, Proc. Am. Acad. ix. 208, Bot. Cal. ii. 423, Syn. Fl. ii. 416.—Genus with the habit of *Scorzonella*, but pappus resembling that of *Stephano-*

meria, supplemented by the single exterior bristle of *Mala-cothrix*. Geographical range somewhat limited north and south, but extending from central California to Utah.

P. NUTANS.—*Scorzonella*, Geyer in Hook. Lond. Journ. vi. 523; *Ptilophora*, Gray, Pl. Fendl. 112; *Calais*, Gray, Pac. R. Rep. iv. 112; *Stephanomeria intermedia*, Kellogg, Proc. Cal. Acad. v. 39; *Microseris nutans*, Gray, l. c. excl. var. *major*.

British Columbia and Montana to the high Sierras of northern and middle California.

P. MAJOR.—*Ptilophora*, Gray, Pl. Fendl. l. c.; *Calais*, Gray, Pac. R. Rep. l. c.; *Microseris major*, Gray, l. c. excl. var. *laciniata*. Utah and Idaho.

P. GRACILOBA.—*Calais graciloba*, Kellogg, Proc. Cal. Acad. l. c.; *Microseris major*, var. *laciniata*, Gray, l. c.

Still known only from Mendocino County, California; the specimens too young, yet by their pubescence and other characteristics, clearly enough representing a distinct species.

NOTHOCALAIS.

Involucre oblong-campanulate; bracts in two series, narrowly lanceolate, membranaceous, with thinner, somewhat hyaline margins, nearly equal, none calyculate. Receptacle flat, alveolate. Akenes fusiform, contracted or rostrate-attenuate at summit, 10-striate-ribbed. Pappus very white and soft, of 10—30, scabrous-margined, narrow, unequal paleæ, with or without some capillary bristles.—*Microseris* § *Nothocalais*, Gray, Syn. Fl. ii. 420, with *Troximon cuspidatum*, Pursh, added. Perennials with linear-attenuate, undulate or crisped radical leaves marked by white-tomentulose margins, and monocephalous, scapose peduncles. Habitat from Northern California to British Columbia and eastward to the Great Lakes, on dry, open rocky places.

N. SUKSDORFII.—Akene slender, 5 lines long, rostrate-at-

tenuate, only half occupied by the seed: paleæ 10—12, very narrow and nearly equal, strictly linear-attenuate, a half inch long: involucre villous-tomentose or glabrate: scapose peduncles exceeding the radical leaves.

Western part of Klickitat County, Washington Territory, April and May, 1882, W. N. Suksdorf.

N. TROXIMOIDES.—Akene fusiform, scarcely 4 lines long, merely contracted summit, nearly filled by the seed: paleæ 20—25, lanceolate below, very unequal, a half inch long: involucre and peduncles as in the last.—*Microseris troximoides*, Gray, Proc. Am. Acad. ix. 211; Bot. Cal. l. c.: Syn. Fl. l. c.

Northern California to Oregon and Idaho.

N. CUSPIDATA.—Akene little contracted, 3 lines long, filled by the seed: pappus of 40—50 unequal, very narrow, setose paleæ and scabrous bristles: leaves all radical, longer than the flowering scapes: involucre glabrous.—*Troximon* Pursh, Fl. ii. 742; Torr. & Gray, Fl. ii. 489; Gray, Syn. Fl. ii. 437: *T. marginatum*, Nutt. Gen. ii. 127.

On bleak, stony hills and fertile prairies, from Dakota and Colorado to Wisconsin and Illinois. Scarcely distinguishable from its far Western congeners except by the pappus. The undulate-crisped, white-hairy margins of the grassy leaves of this giving it an aspect so strikingly unlike the general appearance of the other species of his genus *Troximon*, were points not overlooked by that well traveled and most keenly observant botanist, Mr. Nuttall. That he noticed the peculiarity and was impressed by it is evinced by his effort to invest the species with a new specific name, *marginatum*, more appropriate than Pursh's *cuspidatum*, which was given to it in reference to the acuminate rather than cuspidate bracts, and has, therefore, no fitness, but which must needs be retained in deference to its priority. The name *marginatum* would, indeed, be equally and in the same way, applicable to each of the three known species of *Nothocalais*.

2. *Some species of EUPHORBIA* $\frac{2}{3}$ *ANISOPHYLLUM*.

E. PARISHII. — Suffrutescent, prostrate, glabrous and glaucescent: leaves thick, round-ovate, entire, veinless, 1—2 lines long: stipules setaceous, entire or cleft, obscurely barbellate above: glands minute, short-stipitate, cupulate, marginless, dark red: seed linear-oblong, $\frac{2}{3}$ line long, quadrangular, faintly rugose.

Warm Springs on the Mohave Desert, May, 1882, S. B. Parish, No. 1384.

This plant wears the aspect of *E. polycarpa*, but has the peculiar flowers of that very dissimilar species, *E. ocellata*, which is annual, with much larger, veiny leaves, and round-oval seeds.

E. NEO-MEXICANA. — Glabrous, light green or glaucescent; a span high, erect-spreading, the few ascending branches acutely angled: leaves linear-oblong, veinless, with a few serrate teeth toward the truncate or retuse apex, the sides entire and revolute: stipules setaceous, mostly bifid, ascending or erect: glands minute, green, with a narrow, white or greenish appendage: seed light gray, indistinctly rugose, acutely 4-angled, thrice as long as broad, the upper half gradually tapering. — *E. inequilatera*, Engelm. Mex. Bound. as to the plant of New Mexico. *E. serpyllifolia*, var. *consanguinea*, Boiss. DC. Prod. xv² 43, with the same limitation.

The above character is drawn from specimens of my own collecting, on the plains of the upper Gila in western New Mexico. The sub-erect habit, somewhat wing-angled stem and few branches, must separate this New Mexican plant from the wholly prostrate, terete-stemmed *E. serpyllifolia*. The specimens from California, which the authors referred to have classed with this, must belong to the following. Nothing like *E. Neo-Mexicana* has appeared from any locality west of the Gila Plains.

E. SANGUINEA, Hochst. & Steud. — Glabrous, deep green,

becoming red with age, not glaucescent: a span to a foot high; erect and simple base of stem an inch or two high, parting abruptly into numerous almost horizontally spread-branches: leaves obovate- to spatulate-oblong, with 3—4 pairs of pinnate veins, the margin serrulate above the middle: stipules setaceous, entire or somewhat lacerate, spreading or deflexed: glands minute, dark red with narrow rose-colored appendages: seed dark gray, faintly rugose-pitted, scarcely twice as long as broad.—Boiss. l. c. 35: *E. serpyllifolia* in part, of Watson, Bot. Cal. ii. 74: *E. inæquilatera*, Engelm. Mex. Bound. l. c. as to the Californian plant, doubtless.

Described here from specimens collected by the writer, in Napa county, Cal., October, 1882. *E. serpyllifolia*, besides being wholly prostrate has veinless leaves, and is very brittle, by the absence of fibrous tissue; but the stem and branches of this plant are almost as tough as those of flax. It has the erect-spreading habit, but not the foliage nor the sharply angular branches of *E. Neo-Mexicana*, which latter is also brittle like *E. serpyllifolia*. Our Californian plant matches well African specimens of *E. sanguinea*.

E. RUSBYL.—Annual, pubescent, a span to a foot high, branches ascending: leaves oval, nearly sessile, very oblique, the major side cordate, serrate, and with a single veinlet supplementary to the mid-vein: stipules parted to the very base into a pair of slender, erect, ciliate setæ: glands small, orbicular, cup-shaped, with a reniform, entire, rose colored appendage: seed quadrangular, rugose-pitted, reddish.

Northern part of Arizona, 1883, Dr. H. H. Rusby.

E. VELUTINA.—Velvety canescent: branches and branchlets numerous, prostrate, forming a close mat: leaves crowded and almost sessile, veinless, the lower orbicular and coarsely toothed, the floral obovate-oblong and mostly en-

ture: stipules short, setaceous, entire, deciduous: glands transversely oblong, dark red-purple, with a deep, flabelliform, crenate, white or pinkish appendage: seed light gray, rather sharply angled and faintly rugose.

Probably Lower California, but the specimen has no ticket.

3. *New Polypetalæ.*

RANUNCULUS BOLANDERI.—Stem stout, erect, $1\frac{1}{2}$ —3 feet high, from a fleshy-fibrous, perennial root: glabrous below, the peduncles and calyx pubescent: leaves lanceolate, the radical on very long petioles, the cauline sheathing, margin obscurely repand-denticulate: petals bright yellow, broadly obovate, thrice the length of the sepals; akenes numerous, in a globose head; beak slender, acute, somewhat incurved.

Long Valley, Mendocino County, May, 1886, H. N. Bolander, No. 4730.

This large and showy species has the general appearance of *R. Lingua* of Northern Europe; but that has its akene tipped by a stout, blunt style. The transversely elongated, inflexed callosities which are distributed along the margin of the leaf, together with the great size of the plant, distinguish this Coast Range species from its allies of the Sierra Nevada, *R. Lemmoni* and *R. alismæfolius*.

RANUNCULUS LUDOVICIANUS.—Pilose-pubescent, a foot or two high: branches ascending or depressed, stout and fistular: leaves ternately parted, the segments broad and with some conspicuously callous-pointed lobes or teeth: calyx reflexed, petals 10—15, a half inch long: akenes in a globose head, cuneate-obovate, a line and a half long, thickened upwards, marginless, tipped with a short, slender, recurved style.

High valleys among the mountains of San Luis Obispo County, California, and eastward to Tehachapi Pass. Collected by Mrs. Curran, in 1884. A large-flowered showy species, covering the ground in many places with its depressed flowering stems and branches.

MECONELLA DENTICULATA.—Three to ten inches high: radical leaves entire, the laminal portion rhombic-ovate, acutish: cauline spatulate to linear, obtuse, sharply denticulate: petals narrowly oblong, 2 lines long: stamens 6—9.

Temecula Cañon, north of San Luis Rey, in San Diego County, Cal., March 27, 1885, by the writer.

The genus *Meconella*, with its few stamens, filiform filaments, narrow stigmas and slender, spirally-twisted capsules, together with its peculiar habit, seems more unlike *Platystigma* a good deal than that genus is unlike *Platystemon*. Hence the action of Messrs. Bentham and Hooker in reducing it to *Platystigma*, appears to have been rather arbitrary. This new species has the small flowers of the original *M. Oregana*, Nutt., but the leaves of the stem are denticulate.

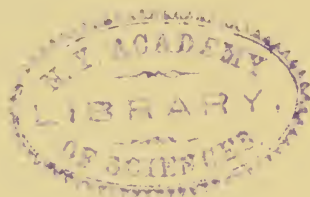
ARGEMONE CORYMBOSA.—Annual or biennial, a foot or two high, robust, simple below, corymbosely branched above, armed throughout with rigid, straight, spreading spines: leaves rather crowded, 1—3 inches long, oval, entire or with shallow, rounded lobes, closely sessile by a broad, somewhat clasping base: flowers white, small, numerous, in an ample corymbose, terminal cyme: capsule oblong-ovate, acuminate, barely an inch long, spinose, 4-valved.

Mohave Desert, June, 1884, Mrs. Curran.

A peculiar species, very leafy, none of the leaves pinnatifid, the uppermost quite entire. The many, small, corymbose flowers mark it at sight as a very distinct, not to speak of the uniformly quadrivalvular, taper-pointed capsules.

DRABA SONORÆ.—Annual, leafy at base, sparingly pubescent with branching hairs: flowering branches slender, racemose from the base: leaves spatulate-oblong, or obovate with cuneate base, coarsely few-toothed: pods oblong-lanceolate, 2—3 lines long, on ascending pedicels of about a line: petals white, minute, little exceeding the sepals, rather deeply emarginate.

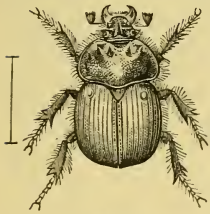
Northwestern Sonora, March, 1884, collected by Mr. Pringle, and distributed under the name *D. cuneifolia*, var. *brevipes*, Watson; but the minute, emarginate petals, branches racemose throughout their whole length, and pods on not only shorter but ascending or sub-erect pedicels, mark it as distinct from *D. cuneifolia*.



A NEW SPECIES OF CALIFORNIAN COLEOPTERA.

By J. J. RIVERS, University of California.

BRADYCINETUS, Horn.

Bradycinetus Hornii n. sp.

MALE.



HEAD.

Male: Form robust, elliptical. Color ferruginous brown, shining; head, tips of armature, margins of prothorax and a spot near the outer margin of prothorax either dusky or black. Head: Clypeus transverse and feebly angulate at the sides, the front edge rising increasingly backward, until just before reaching the clypeal suture it ends in a well formed tubercle on either side; behind the sutural line on the vertex is a very prominent, stout, conical horn in front of the base of which the surface of the head is slightly concave; three-fourths of the lower portion of the horn and the whole of the frontal area finely rugose. Antennæ: funicle shining, chestnut; club paler, not shining. Thorax: subtriangular, deepest longitudinally through the center; noticeably wider than the elytra at their juncture, and rather wider than their greatest breadth; seen from above the front margin appears truncate in the middle, then trends obliquely forward to the angles which are prominent; sides straight for a short distance, posterior angles strongly rounded; posterior margin much extended in the middle with distinct sinuations toward the angles. The front area deeply concave, surmounted by four well formed tubercles; two occupying the center, bold and projecting over the concavity, two others, one on either side of the central two, situated near the anterior margin of the thorax at its exterior angles. The area around the two anterior tubercles very rugosely punctate; and transversely across the disc are large distinct punctures nowhere extending to the posterior margin. A well defined margin, reflexed at the sides, surrounds the whole. Elytra: very convex, obtusely rounded behind, having fourteen well defined and regularly punctured striæ, the interstices of which are flattened and indistinctly wrinkled. The under side paler than the upper; dense fringes of light chestnut hair line the reflexed portion of the thorax and elytra, while the femora, tibia and tarsal joints, as well as the lower side generally, are well supplied with rather long chestnut hair. Length, .48—.52 inch.



FEMALE.

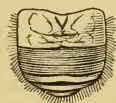
Female: Form and color as in male. Labrum projecting, rugose, covering the mandibles. Head: clypeal margin raised; a feeble tubercle just in front of the clypeal suture, immediately behind which is a central transverse ridge, undivided, slightly higher in the middle and slightly apiculate at either end. Antennæ less robust than in the male. Thorax: very convex, shining; outline obtusely triangular; anterior margin seen from above, truncate in the centre; angles produced; sides rounded; posterior margin much produced to meet the scutellum, sinuate toward the angles which are rounded; the front discal area characterized by a bi-lobed transverse raised line at either end of which, outward and forward, is a well formed but depressed tubercle; behind which line the disc is dense with coarse corrugated punctures, which become scattered and plain, nowhere reaching the posterior margin, but taking a transverse course, barely reach the side margins, where they become less distinct. Elytra: much the same as in the male, but the interstices of the fourteen punctate striæ a trifle more wrinkled and much more convex. Length, smaller than the male.

Habitat: burrowing in the ground near the city of Sonora, Tuolumne Co., Cal.; found also in Sacramento Co.

The name selected for this species is intended to be a slight tribute of honor to Dr. Geo. H. Horn, the eminent Coleopterist, as a slight return for many favors.

STRIDULATING ORGANS.

Chas. Fuchs, Esq., having obtained living specimens of the above new species of *Bradycinetus* discovered that it possessed the power of stridulating. His researches through coleopterological literature disclose nothing relative to the stridulating faculty in this genus. The latest work on classification, that of Le Conte and Horn, makes no mention of it, and as these able authors always notice such biologic characters when aware of them, it is safe to affirm that the observations of Mr. Fuchs are new, and that to him belongs the credit of the discovery of these particulars.



The anatomical investigation by Mr. Fuchs of this beetle discloses the stridulating apparatus to be well developed, and to consist of three transverse bands situated respectively upon the fourth, fifth and

sixth dorsal segments, that on the fourth segment showing boldest. Each of these bands is seen with a high power to consist of cernuous bristles set in oblique rows, alternating and interlacing with one another; the point of each bristle is bent downward, forming a bow, and the band, as a whole, gains elasticity by the pressure of each bristle thus bowed against the next in the series. The rubbing of these three bands against the edges of the elytra produces the stridulation. The examination of species of the allied genus *Bolbocerus* shows the same stridulating power, but the outline of the bands in each case so differs as to show specific characters.

**CONTRIBUTIONS TO THE LARVAL HISTORY OF PACIFIC COAST
COLEOPTERA.**

By J. J. RIVERS, University of California.

The study of systematic entomology affords the student but a dim idea of what insects are noxious and what are innoxious. The distinctive characters upon which the systematic entomologist builds classification need not be and generally are not the characters of prime importance to the economic entomologist. The names of many of the groups of Coleoptera afford a slight generalized description which is often misleading. In the present state of entomologic science, where systematic is given precedence over biology, it is dangerous to attempt to make a general statement of the habits of a single genus and impossible to generalize the habits of a group or family.

The most valuable contribution to the life history of American insects which is generally accessible is Dr. Packard's "Insects Injurious to Forest and Shade Trees."* In his introduction the author states that this work is purely tentative and designed to elicit the results of the observations of students of economic entomology. It is on that account that I feel at liberty to comment upon or question certain of Dr. Packard's statements.

On page 118, *op. cit.*: *Prionus laticollis*, Drury, is noted as injurious to the poplar. If *Prionus* destroys living trees in other parts of America it has no such destructive habit in California; in fact the charge against borers that they destroy trees is a very old one, but by no means substantiated by my own observations. *P. Californicus* goes through its transformations in the roots of oaks, but these roots were dead in every case observed by me and usually belonged to

*U. S. Entomological Commission, Bulletin 7, Washington, 1881.

stumps whose trunks had been felled years before. Last year I bred several from the decayed part of an old oaken chopping block. In fact Dr. Packard himself throws some doubt upon the destructive habit of *P. laticollis*, for in his note he quotes the report for 1872 of Prof. S. J. Smith, Entomologist to the Connecticut Board of Agriculture, as follows: "I have noticed it in logs of poplar, bass-wood and oak, and in the trunks of old, decaying apple trees."

On page 137 *op. cit.* is the following: "We have found Buprestid and Longicorn borers in a dead sweet gum tree." The caption at the head of the page, "Insects Injurious to the Sweet Gum," seems designed to lead to the inference that these borers killed the tree. But my observation is that the larvæ of insects of the two families noted feed only on dead wood.

Again, on the same page, *Ptilinus basalis* and *Micracis hirtella* are listed as injurious to the California Bay. These species are both found in Berkeley, and I have observed their habits for the last seven years, and as a result of such observation I am in a position to assert that they bore into the twigs of the tree mentioned only when dead, dried and decaying.

On page 71, *op. cit.*, we find a figure of *Oncideres cingulatus* in the act of girdling a hickory twig. In connection with this insect we meet with one of the most interesting and remarkable points in the whole range of insect biology. For, knowing that its larva will have to feed upon dead and sapless wood, this beetle, at the time of depositing its egg in the living and easily penetrated green wood, has instinct or forethought to girdle the twig, and thus assure the future larva the conditions necessary for its metamorphosis.

The question, "Are *Curculio* larva lignivorous?" has been partially discussed in Bulletin of the Brooklyn Entomological Society, vol. vii, page 150, by Warren Knaus, and in *Entomologica Americana*, vol. i, page 18, by W. H. Harrington. The question was brought up by the finding of

Wollastonia quercicola in cottonwood logs in an advanced stage of decay. The Curculios are a group of insects in systematic value the equivalent to a sub-order, and known as the Rhynchophora (Latreille), which bear certain intimate resemblances to one another in the perfect and final forms, while in their larval stage they may and certainly do differ in many particulars of habit. *W. quercicola* belongs to the Calandridæ, a family abounding in species whose habit in the larval stage is preëminently to feed on dry food. The metamorphoses of the Rhynchophora (Latr.) are not at all well known, but I have bred the following, belonging to this sub-order, and have found them to be lignivorous in the larval stage:

PLATYRHINUS LATIROSTRIS Fabr. — Decaying oak stumps highly charged with mycelia of a fungus.

SCOLYTUS DESTRUCTOR Oliv. — Dead sapwood of elm.

MESITIS TARDII Woll. — Decaying beech.

MONARTHURUM HUTTONI Woll. — Various hard woods.

HYLESINUS CRENATUS Fabr. — Dying ash.

ANTHRIBUS ALBINUS Lin. — Old wood.

BRACHYTARSUS SCABROSUS Fabr. — Elm bark.

RYNCOLUS — several species. — Bark of trees.

The foregoing are old world species of Curculios that do not affect a herbaceous diet; and the three following species are of similar habits.

SCOLYTIDÆ.

MONARTHURUM SCUTELLARE Lec. — Bark of dead *Quercus agrifolia*.

MONARTHURUM DENTIGERUM Lec. — Bark of dead *Quercus agrifolia*.

MICRACIS HIRTELLA Læc.—Dead branches of *California laurel*, *Umbellularia Californica*.

The Brenthidæ are well known to have the general habit of perforating trees and of depositing a single egg in each hole thus made, by this means providing that the larva shall have a full supply of the wood upon which it feeds.

The question, then, should not be: are *Curculio* larvæ lignivorous? but rather, how many have that habit? In a great group like this of *Curculios*, comprising many forms varying greatly from one another, one can easily appreciate the fact that we meet with many different tastes and habits. Some are known to feed upon all kinds of grain in store; one finds its food in rice, another in barley, and others in maize. Many species of *Balanus* undergo their changes in nuts, the larva feeding upon the kernels; another group is to be found in *Cynips* galls; and one species, geographically distributed from San Diego to Alaska, is to be found beneath seaweed upon the shores. Enough has been instanced to show clearly that we can draw no inference from the fact that two insects are found in the same natural group, that for that reason their habits are similar; and it is evident that a classification by habits would be of little aid to the systematic entomologist.

CHRYSOMELIDÆ.

DIABROTICA 12-punctata Oliv.—This is a most destructive insect to our peach orchards, and is not as yet sufficiently studied. If it resembles in habit the eastern species of the genus, and feeds in the larva stage upon the roots of cereals, it may be possible to rid ourselves in some degree of this pest by some rotation of crops. In the meanwhile sprays and washes are beyond a doubt not only useless, but in most cases a positive injury. We shall have to study further before speaking positively of the larval history of this insect pest.

The Ptinidæ is a family of limited extent, whose habits seem to be very similar wherever members of it are found. In California I have observed the following:

MELANDRYIDÆ.

DIRCÆA RIVERSII Lec.—Larva feeds in decaying trees of Madrona, *Arbutus Menziesii*. In trees in position the insect is found in the primary forks of the roots, and in prostrate logs among the more seasoned fibers of the wood.

PTINIDÆ.

PTINUS INTERRUPTUS Lec.—Black fungus of the laurel, *Umbellularia Californica*.

PTINUS QUADRIMACULATUS Melsh. — Decayed *Ceanothus thyrsiflorus*.

HEDOBIA GRANOSA Lec.—Dead branches of *Umbellularia Californica*.

HADOBREGMUS GIBBICOLLIS Lec.—Decaying wood of *Myrica Californica* and dead willow.

VRILLETTA CONVEXA Lec.—Dead *Quercus agrifolia*.

PTILINUS BASALIS Lec.—Dead twigs of *Umbellularia Californica*.

SINOXYLON DECLIVE Lec.—Any dead tree or unpainted wood, very partial to wine casks and oak barrels. The depredations are done by the beetle while boring for a suitable place to deposit its eggs. Its burrow is straight across the grain of the wood, reaching the interior of the cask, causing waste and deterioration of the contents. Hot solution of alum applied to the outside of the casks will prevent boring.

POLYCAON STOUTII Lec.—Dead and dried willow.

POLYCAON CONFERTUS Lec.—Found boring into a slab of chestnut oak that had been deposited for years in the museum of the University of California; also bred from the stem of dead apricot trees that had been grafted on a peach root.

There appears strong evidence that these trees were not destroyed by the borer, but through the influence of the "black knot" on the roots, they being diseased with knobs as large as a man's fist on every root; while all the trees killed had the root diseased, only a portion was infested with the larva of this beetle.

Many similar observations made by myself and others go to show that in the larval stage this beetle is xylophagous. On the other hand, there is indisputable proof that this larva infests living trees by entering the twigs at the axils of the leaves.

LYCTUS STRIATUS Melsh.—Devastates furniture made of California laurel, *Umbellularia Californica*. Dr. Packard, *op. cit.* p. 75, quotes Dr. LeConte as saying that it affects the trunks and branches of *Carya tomentosa*. This is not borne out by my observations, as I am well satisfied that the larva lives in dead and dry wood.

SCARABÆIDÆ.

POLYPHYLLA DECEMLINEATUS, Say. Larva that produced this species was found in the earth from one to two feet from the surface, among root fibres of a coarse grass and roots of a Californian Laurel. *Umbellularia Californica*. The earth was sandy loam situated upon the banks of a river, and which is overflowed during the rainy season of the year.

ODONTAEUS OBESUS, Lec. This has a light chestnut larva with tufts of bristles surrounding each spiracle. Mandibular and clypeal portions well developed, redder in color and

thicker in texture than any other part. The legs are prominent. Feed upon rootlets of *Umbellularia Californica*. It is much infested with a small, pale-colored mite which is evidently parasitic on the species.

LUCANIDÆ.

PLATYCERUS OREGONENSIS (Westwood) — Dead trees of *Photinia arbutifolia*, *Umbellularia Californica*, *Quercus agrifolia* and *Eucalyptus*.

PLATYCERUS AGASSII Lec. — Decayed trees of *Arbutus Menziesii*; also in wood too much decayed to be identified.

SINODENDRON RUGOSUM Mann. — Decayed oak, *Quercus agrifolia*.

The 522 North American species of *Cerambycidæ* are all borers; the insect deposits its egg in a hole perforated in the wood, and the larva penetrates further and further according to a rhythmic order peculiar to the species until its metamorphoses are completed. The following is a list of the Californian species whose habits I have observed:

CERAMBYCIDÆ.

ERGATES SPICULATUS Lec. — Rotting coniferous trees. Bred from *Sequoia sempervirens*, *Pinus insignis*, *Abies Douglasii*, etc.

PRIONUS CALIFORNICUS Mots. — Bred from rotten damp roots of *Quercus agrifolia*.

ASEMUM NITIDUM Lec. — Decayed *Pinus insignis*.

HYLOTRUPES LIGNEUS Fab. — Dead trees of *Libocedrus decurrens*.

ELAPHIDION IMBELLE Lec. — Bred from decayed oak near San Diego, Cal., by F. E. Blaisdell.

HOLOPLEURA HELENA Lec.—Dead twigs of *Umbellularia Californica*.

ROSALIA FUNEBRIS Mots. — Decaying *Umbellularia Californica* among the mycelia of some fungus.

XYLOTRICHUS NAUTICUS Mann.—Dead sapwood of the oak, *Quercus agrifolia*.

XYLOTRICHUS PLANIFRONS Lec.—Dead branches of willow.

NECYDALIS LÆVICOLLIS Lec.—Decayed oak, *Quercus agrifolia*, and in dead *Eucalyptus globulus*.

LEPTURA LÆTA Lec.—Dead *Quercus agrifolia* and *Quercus* sp.

LEPTURA CRASSIPES Lec.—Decayed wood of *Umbellularia Californica*.

SYNAPHÆTA GUEXI Lec.—Dead limbs of California buckeye, *Æsculus Californica*.

POGONOCHERUS CRINITUS Lec.—Dead branches of *Quercus agrifolia*.

TROGOSITIDÆ.

TROGOSITA VIRESCENS Fab.—Dead *Libocedrus* and several kinds of oak.

CLERIDÆ.

THANASIMUS EXIMIUS Mann.—Dead twigs of *Umbellularia Californica*.

Among many entomological enigmas of long standing is one that is about being solved. From time to time in many parts of the United States, large luminous larvæ of some Coleopteron have been found, and it has been conjectured that these larvæ belong to some of the Elateridæ, the general supposition being that they were larvæ of the genus *Melanactes*. Every attempt at breeding them resulted in

failure because their natural food was unknown. I have recently found what their food consists of. Before making this discovery I had arrived, from a careful study of the anatomy of the mouth parts of these larvæ, at the conclusion now confirmed that they are carnivorous in habit.

Their food consists of the vegetable feeding Myriapoda, particularly of *Julus* and *Polydesmus* with a preference for *Julus*, because the large area of the rings of this genus affords space for the larva to penetrate the interior of the Myriapod. Its manner of feeding is to seize the hinder part of the *Julus*, and perforate a segment, reaching the soft inner parts, which it devours at leisure, creeping through many segments without disjoining them, and remaining inside these rings for days at a time, till one can see little else but the slowly wriggling form of the dying *Julus*.

I have a full fed larva, which I hope will go through its metamorphosis, and solve the problem. And now its mode of life is made known, other persons who are equally anxious with myself that nature shall yield this long kept secret, can apply themselves with renewed energy to the task of discovering the identity of the perfect insect.

NOTES ON SATURN.

By Prof. GEORGE DAVIDSON, A. M., Ph. D.

After midnight of Friday, the 13th November, 1885, the atmosphere was unusually steady; sky clear; no wind; atmosphere saturated with aqueous vapor; heavy dew falling. The satellites of Saturn were plainly visible with a moderate power to the equatorial of 6.4 inches objective. The planet was examined for nearly two hours with different powers, the best effects being obtained with powers of 300 to 350 diameters; and the summary of the matters of interest is as follows:

The Encke division was traced for 120° about each end of the major axis, leaving only 120° not seen. The division was faint but it was there, a little outside the middle of the ring *A*.

In the ring *B* the inner part presented such an appearance in its delicate shading as would arise from a rapid horizontal rotary motion being given to a disc of irregularly distributed and yielding matter. I could detect no atmospheric unsteadiness that would give rise to this phenomenon.

The dusky ring presented equally distinct ansæ; on former occasions I had been satisfied that they were sometimes of different brightness, and had endeavored to find some law for this variation. The dusky ring was well defined at the ansæ and across the body of the planet, but I was convinced that the limb of the planet was visible through the dusky ring, very nearly, if not quite up to the inner edge of ring *B*.

The shadow of the planet was cast upon the preceding side, and where it reached the outer edge of the ring *B*, it was recurved farther from the planet as if the outer edge of *B* had a round moulding above the general level of the plane.

The markings of the planet were quite distinct. The darker color of the pole was gradually toned down until it met the second moderately faint belt south of the equator. The second belt was quite dark but appeared to have a more marked darkness on the following side of the central line, where it should have been brighter on account of the sunlight. Then came the bright equatorial belt without markings and north of it a narrow dark band about half as broad as the trace of the dusky ring across the planet, with a narrow dark band about half as broad as the trace of the dusky ring across the planet, with a narrow lighter space between it and the edge of the dusky ring.

January 8, 1886. The atmosphere was unsteady, but at quiet moments I saw the Encke division by using a power of 250 diameters. Observations made with the Clark Equatorial of 6.4 inches.

January 25, 1886. The atmosphere was wonderfully steady. I saw the dusky ring of Saturn with powers as low as 150 diameters, and the equatorial beltings were beautifully sharp. The shape of the shadow on the outer part of the *B* ring was apparently not so recurved as heretofore. I saw the limbs of the planet through the dusky ring to the inner edge of ring *B*. I was able to follow the grayish inner edge of the *B* ring across the body of the planet and in contrast with the dusky ring below it. The Encke division at the preceding part of the ellipse was clearly outside the middle of *A*; at the following part it was barely outside the middle of *A*; no difference of breadth of the Cassini division could be distinguished at either extreme.

February 14, 1886. Atmosphere steady. Carried powers to 450 diameters. The Encke division clearly exhibited; on the preceding side it is outside the middle of *A*, on the following side it is barely inside the middle of *A*; I carry it well down to the narrow part of the ellipse. The dusky ring is well seen and it seems that the inner edge extends more than half way from *B* to the planet. The limbs of the

planet are seen through the dusky ring and the inner edge of *B*. I cannot determine any difference of brightness between the preceding and following parts of the dusky ring.

I have watched carefully and repeatedly a minute—excessively minute—and white protuberance on each side of the planet apparently off the broad bright equatorial belt, but really at the points where the faintly dark belt nearest the dusky ring disappears at either limb. This would seem to indicate that this faint dark belt is raised above the general surface of the spheroid.

March 31, 1886. To this date I have not been able, on account of atmospheric conditions, to test the last observations of February 14.



WEATHER TYPES ON THE PACIFIC COAST.

By W. A. GLASSFORD, 2d Lieut. Signal Corps, U. S. A. Assistant.

(With Four Plates.)

A short study of the charted weather reports of the Pacific Coast, reveals certain types lasting for a considerable period which admit of classification. East of the Rocky Mountains, however, no such characteristics are present; the storms or cyclonic areas, as well as the anti-cyclonic or areas of high pressure generally originate in the Gulf of Mexico, the Rocky Mountain slopes, or in British America, and move in succession over a curved path almost invariably to the eastward at a uniform rate, and with uniform characteristics. They disappear as regularly near Nova Scotia. It is very seldom, if ever, that perfect paths of low pressure areas are traced from the Pacific Coast across the mountain plateaus and ranges, although some few cases have been charted on the storm track maps; but even these are not so uniform as in the East, for they frequently tarry for quite a period, clinging to some valley or plateau. On this coast a noticeable feature is the difference in the storm frequency between the northern and southern boundary lines of the United States. Areas of low pressure of any intensity are of infrequent occurrence in southern California, but going north become more frequent as Vancouver Island is approached. From a search of the Weather Reviews for three years, it is found that areas of low pressure entering the Pacific Coast states from the ocean during that period number 90; those north of the 45th parallel are 54; between 45° and 40°, 25; between 40° and 35°, 10; below the 35th parallel, 1. Another peculiarity of the areas of high and low pressure here is their arrangement in recurring and symmetrical types; recurring, because there is a tendency to assume the same barometric condition on successive days; symmet-

rical, because the recurrence as denoted by the barometer takes about the same area, shape and intensity.

Except the November, and the greater storm of January last, and in fact the centers of these were the whole time at sea, there has been no distinct cyclonic area, such as appear in the Eastern States, central over California during the past season. Those who examine the Signal Service synoptic charts with its reports may have observed "High" and "Low" designated, but these are often such only by contrast; the areas where the group of barometric readings, reduced to sea level, are the greatest or the least that appear on the map, being so named.

Another observation may be noted. When severe and stormy weather prevails on this Coast, and especially in California, almost invariably the press dispatches announce from the East the prevalence of cold waves, snow blockades, tornadoes, etc. If complaint be made at any time that the climate of the Pacific Coast is in no way superior to the ordinary Eastern weather, attention may be drawn to the fact that at that time cold waves, snows, etc., prevail over the East; if here the winds are high they are balanced by tornadoes or hurricanes there; if washouts delay travel on this slope, floods in the streams of the great Eastern valleys and seaboard do vastly more damage; if frosts nip the buds in our California citrus belt, in Florida oranges are frozen. Such is the action of storms on this Coast relative to the margin of the great Arctic high pressure ridges which surge down from British Columbia. These coincidences show a common sensitiveness to distant weather conditions. Contrary to the usual rule in the states east of the Rocky Mountains, we have observed here a recurrence and persistence of fine clear weather, or of rainy days for quite a period. The interruptions are slight, of short duration, and the prevalent types are unmistakable. The synoptic charts during these periods show a general resemblance. For instance, during February last scarcely any rain fell.

In April we had almost constant rain from the 1st to the 17th, then followed suddenly clear weather to the month's end and after. The fact that the change from one type to another is so very sudden is what causes the difficulty on this coast in forecasting the weather. These phenomena, as aids to forecasting, I call weather types.

This study is only possible by reference to the reports of the observations taken three times a day simultaneously at 4 A. M., noon and 7 P. M., Pacific time, telegraphed to San Francisco and charted by entry on outline maps. Isobars and isotherms are drawn showing the belts or areas of like pressure and temperature, and symbols are added marking stations where rain has fallen or cloudiness exists. It is seen that map after map, day after day is almost identical. A persistence of some one barometric characteristic covers the same region. Applying the principle of composite photography, taking a transparent outline map of the same scale as the weather map and drawing lines enclosing like areas, and continuing this process on the same transparent map, we have represented a great number of like areas superimposed upon each other.

We thus find the high or low barometer regions to correspond with certain characteristic conditions of cloudiness and rain, which remain stationary and hover over the same locality during the continuance of the high or low. For instance, grouping all the charts that have high pressure over Oregon, and the low over southeastern California, it is noticed that remarkably fine warm weather with northwesterly winds continues for a succession of days, while this condition lasts. When the barometer changes, it does so suddenly, and the weather changes with equal rapidity. The greater the number of these like features of barometer and weather found, the greater, of course, is the frequency of the type. Illustrating in the case of February last, it is found that a persistent high overlay the district embracing Oregon with parts of Nevada and Idaho. Plate II illus-

trates the superimposing of a series of daily charts showing this feature.

Indeed, if only the observations of a single station are studied, taking a specific instance of the recurrence of a persistent weather type, the list of days in which rain of any consequence fell on successive days in San Francisco during the last rainy season, shows six such periods lasting from six to fifteen days each. These periods of the rainy season, and the contrasting conditions of rain absence intervening, are the special object of this inquiry.

I now come to determining and naming these weather types, commencing with the rainy season of 1885-6. On November 1st, the first interruption of the dry season of 1885, disregarding some slight rains occurring prior to this date, began at the time when the high, which had moved inward from the coast with the advance of the season and finally hung stationary over the eastern slope of the Cascade Range, moved further eastward before the low area advancing on the Washington Territory coast from sea. This low area spread south and brought the rainy season for San Francisco and this portion of the State. This type I call the

NORTH PACIFIC CYCLONIC.

It prevailed from November 1st to 10th, and from January 11th to 14th, and is distinguished by a low barometer area of considerable depth over and to the westward of Oregon and Washington Territory, which, striking the mountain range and high pressure to the eastward, cannot break over the barrier, and is held there with fluctuating depth for some time.

The high, which always exists somewhere in the margin of the low, continues central in the district north of Salt Lake. During the prevalence of this type, southerly gales occur from Cape Mendocino to Vancouver Island. Rain prevails and frequently becomes heavy over Oregon, Washington Territory, in California south to San Luis Obispo

and in the San Joaquin Valley. The temperature throughout the coast is about normal. It is only when a subsidiary low is developed in southeastern California, locally called a "Sonora Storm," that rain spreads over the southern part of the State, being generally of short duration. See Plate III as an example of the conditions existing during this type.

INTERIOR ANTI-CYCLONIC.

This second type closely resembles the preceding in that the interior high is well marked, but differs in that the low upon the coast is less in depth. This type prevailed from November 11th to 15th; November 25th to December 6th; December 14th to 26th; January 27th to February 12th. It is characterized by a high barometer (about 30.30 inches) over Utah, Nevada and Southern Idaho. The accompanying low barometer on the northern coast drops down frequently to 29.70, and is central west of Washington Territory. These lows appear to beat against the high, the low area often dropping down for a short time nearly to Cape Mendocino. At other times they push the high southerly over Arizona and pass eastward beyond our boundary. Again when the surge of high pressure is very great over Idaho, a low often pushes upon it from the southwest coast of California, at which time rain may occur in light showers on the southern coast. The rainfall, except as just mentioned, never passes south of San Francisco, and is generally limited to light showers in Oregon and Washington Territory. Gales are very strong from the southeasterly at Cape Mendocino and at the mouth of the Columbia River, north of which they come more from the south. The temperature is usually high, and at times, of steep gradients, from Nevada southward; near Los Angeles, the warm "Santa Anna" winds may occur. Plate III serves to illustrate this type if the pressure over Idaho and Nevada is considered about 30.30, and the low on the North Pacific Coast about 29.80 inches.

NORTH PACIFIC ANTI-CYCLONIC TYPE.

This type is very frequent, but sometimes of short duration. It prevailed from November 10th to 15th; December 7th to 13th; December 31st to January 10th; February 12th to 21st; February 23d to 25th; March 10th to 12th; March 23d to 28th; April 2d to 5th, and April 17th to 29th. While this type is prevalent the high, as is implied by its name, rests over Oregon and Washington Territory, with a permanent low over southern California. It is attended with clear weather, only interrupted by an occasional shower near Vancouver Island. During its prevalence in its perfection and greatest intensity, and while the isobars are perpendicular to the coast line, is the time when the dreaded dessicating "north wind" prevails in the Sacramento and San Joaquin valleys. The temperature is high during the day, especially after several days' continuance of the type, while at night frosts often occur. The winds are usually light and variable on the coast of Washington Territory and Oregon, but on the coast of California high with southerly gales. If in the spring during the prevalence of this type high winds and sandstorms occur in southern California, they are almost sure to be followed by rain. The proverb that a succession of frosts is liable to be followed by rainy weather, obtains warrant from the fact that the breaking up of this type is usually foretold by frosts and most certainly followed by rain. The occurrence of this type on the first ten days of January, 1886, appears to bear a certain relation to the great surges of high pressure from the Arctic regions moving well westward over British Columbia. The isobar of 30.3 to 30.5 inches enclosed the area. The weather on the coast was unusually cool and clear; frosts extended into southern California. During this period remarkably cold weather was prevailing in the Eastern States. These surges of high pressure in their movement covering almost the width of the continent during the first ten days of January, caused the development

of intense cyclonic areas originating in the Gulf of Mexico or Texas and moving northeastward along the Atlantic coast, accompanied by the most severe cold wave of the year east of the Rocky Mountains. Plate II illustrates this type.

THE GENERAL CYCLONIC TYPE.

This type is characterized by the most severe storms that occur on this coast. The rain area overspreads all sections, falling in torrents, and gales of the greatest violence with frequent thunderstorms occur, rivers overflow, and wash-outs impede travel. The barometer drops very low and suffers rapid fluctuations, and remarkable gradients occur between the coast and interior. Simultaneous with this type is a series of exceedingly high pressure waves over the Rocky Mountain plateau and states to the eastward, accompanied by severe storms and intense cold. During the last season there were only two occurrences of this type, viz., from November 15th to 25th, and January 15th to 26th. The general feature is a cyclonic disturbance on the Pacific coast line, which, apparently unable to cross over the Sierra Nevada, seems to spread out over the entire length of our region, until it gradually wastes away or finds escape beyond the limits of our field of observation. The occurrence of this type in January last is especially worthy of careful review. On the 15th another surge of high pressure followed the north Pacific anti-cyclonic of the first ten days of January, extending from British America over the Rocky Mountain region. On this coast was developed a series of storms among the severest in the history of the country. The temperature was very low in Montana, and spread its influence over portions of this coast, causing frost, snow, ice and unusual cold in portions of the Pacific States. Rains were heavy and almost continuous, gales frequent and severe, needing no description to those who were here at the time. The storm, as represented by

the barometer, was a series of most extraordinary fluctuations; the disturbance would suddenly appear at any given station, and after a few hours be scarcely perceptible, only again to appear at this or some other station. A diagram showing these fluctuations is interesting. The center appeared for a time to be over the interior valleys of California, and not great in depth, and it was only upon consulting ship reports that it was found that the eye of the storm was far to the westward. This center appeared first upon the coast about 3 A. M., January 20th, off Point Conception, where the roughest weather was experienced. A few hours later it was reported off the mouth of the Columbia River. From 5 to 8 A. M., about 175 miles southwest of San Francisco, the *Zealandia* was in a southeast and southwest hurricane, with the glass at 29.23. The barometer, about the same time at San Francisco, was 29.31 inches; at 8 A. M., at Cape Mendocino, the barometer fell to 29.15, with the wind a hundred miles per hour from the S.E.; at noon it was 29.06, with the wind from the southeast and blowing with hurricane violence, carrying away the anemometer, after which accurate observations were interrupted for a few hours. At the same time the wind was southwesterly at San Francisco, blowing 42 miles, but at Point Lobos, the south head of Golden Gate, six miles away, it was 96 miles an hour. The cyclone was off the coast of Oregon at 7 A. M., as shown by a pressure of 29.17; but by the following morning, the 21st, at 4 A. M., the pressure had risen, and the cyclone had completely vanished from the charts, and by 12 M. the isobar of 30.20 passed from Washington Territory through Oregon down to the center of California and out near San Luis Obispo. But one other isobar (30.10), drawing isobars for every tenth of an inch, appeared on the chart, and this enclosed northwest Washington Territory. The next morning (22d) the cyclone reappeared at the mouth of the Columbia River, here also carrying away the anemometer. It again subsided, and burst in once more the same day at the

Straits of Juan de Fuca, the glass going down to 29.00. Again almost disappearing, it came in upon the Washington Territory coast the 26th, the barometer falling this time to 29.15. On the 27th it was not to be seen, and if it passed eastward it did so far beyond the northern boundary.

During this time severe washouts occurred in Southern California, and the telegraph lines were everywhere prostrated. I find this type is not a frequent one, and comes only in such intensity as described at long intervals. The great storms of 1875 and 1879 are the only ones that can be ranked with this one. See Plate IV.

The next distinct type is the

SOUTH PACIFIC ANTI-CYCLONIC,

which appears as a moderate high along the southwestern California coast. It is peculiar on account of the rains which accompany it, being one of those types which bring out many inquiries from those having and observing barometers, asking the question, how it is that we have rain with so high a barometer. It creates isobars somewhat perpendicular to the coast, bringing in the rain-bearing southerly winds at San Francisco. It is noteworthy that any type exhibiting isobars perpendicular to the coast line is almost sure to bring rain, while if the isobars are parallel to the coast, fair weather follows. This type was in existence from March 31st to April 2d, and from April 7th to 17th. During its prevalence a faint low may exist in the north Pacific. Rain occurs in the interior California valleys and northward, also in the vicinity of Los Angeles. Should the general pressure fall considerably below the normal, but with the relatively high barometer continuing in the same region, gales with thunder and hail storms are frequent in southern California. The winds are not strong north of San Francisco, except when the barometer becomes very low, and such cases are few. This type disappears by the movement of the high along the coast into Oregon, and

ceases very suddenly. The temperature is unusually low. See Plate V.

SUB-NORMAL TYPE.

This type is marked by a succession of days when the pressure is moderately low, and below the normal over a large area. The isobars are broken up, are wavy or enclose several subsidiary low areas, with an absence of any decided gradients. This type prevailed from February 26th to March 4th, and from April 5th to 7th. Rain at intervals occurs, frequent local storms, and thunder storms are reported. Occasionally a gale, but local in character, does considerable damage. The winds are variable, and the weather cool and cloudy.

It might be well to add that the changes occurring in the cyclonic types follow a general principle that a disturbed equipoise recovers itself in proportion to the intensity and rate which the disturbance has originally developed. The greater the high, the greater the depth of the low which follows, and if the change is sudden, the appearance of the opposite condition is sudden. In meteorology, as in mechanics, these vibrations of the disturbed equipoise are liable to continue for some time in waves of gradually decreasing length before coming to rest; and the observance of this principle enables us to say that a disturbance is not definitely passed although the synoptic charts give but little indication of its recurrence.

The dry season demands only the briefest consideration, having but one general characteristic—high pressure over the sea and low over the land. The type of the dry season has about the sameness of the weather which accompanies it. The high is greatest and most persistent over the ocean and north Pacific coast, and lowest from Arizona to Nevada including eastern California. Almost the only peculiar feature of the type is the occasional low over the central valleys of California.

Rain is almost entirely absent when this type becomes perfectly established, and only occurs in light showers in Oregon and Washington Territory, when the high happens to drop down well on the California coast, creating a condition similar to that of the "South Pacific Anti-Cyclonic Type," already described. Another feature of the dry season is the development of considerable intensity of the high in Oregon, the pressure being at the same time very low in southern California, creating the northerly winds in the Sacramento and San Joaquin valleys.

The boundary between the wet and dry season would, I believe, be as definite as the sun's march north or south if not for these disturbing weather types, which bring into effect conditions overriding the gradual change of temperature. It is well established that the temperature of the Pacific Ocean differs very little anywhere on the coast, and the monthly variation is so slight that it may be disregarded. We can in a general discussion say that the temperature of the ocean washing our shores is about constant. It is wholly different over the land, and the difference increases in proportion to the distance from the sea. In the winter, the prevalent type is such as to drive the ocean winds over a country where the temperature is cooler than themselves, and where the condensing conditions are strong enough to well deplete them of moisture; hence rain results upon the western slopes and little remains for the Rocky Mountain country. During the summer, on the contrary, the winds from the Pacific Ocean passing at once over the drying country, do not precipitate their moisture at all till the Rocky Mountain summits condense them. Thus the rainy season is transferred from this coast to these higher regions. The change of one season to another is best illustrated by projecting the curve of surface temperature of the Pacific Ocean, with the mean daily temperature of a place in proximity to it, for instance, San Francisco. As soon as the air temperature curve permanently crosses the former, the

change of season takes place. A specific case of this principle is discussed and well illustrated in the last Bulletin of this Academy, by Prof. Davidson, in his paper on the air and water temperature at the Golden Gate.

NOTE—The plates show in figures for each station: 1st, temperature; 2d, barometer; 3d, wind velocity and, when reported, the minimum velocity since the last report, in brackets; 4th, the amount of rainfall. The wind direction is shown by an arrow flying with the wind. The state of the weather at the time of the report is shown thus: cloudy or fine day, circles fully or one-half shaded; rain by L. R. or H. R., as it is heavy or light; S for snow.

TRANSITS OF THE II AND III SATELLITES OF JUPITER.

By GEORGE DAVIDSON, U. S. Coast and Geodetic Survey.

[Davidson Observatory, March 20th, 1886.]

About three o'clock in the morning of Sunday the 21st, I watched the transits of the II and III Satellites of Jupiter and their shadows. The shadow of the II Satellite was on the northern edge of the northern dark belt, but it was intensely black; the image of the satellite was probably a diameter from the shadow but was in the edge of the white part of the planet. This image was more than white; it was a *brilliant white*. The image of the III Satellite was yet three or four diameters outside the planet's limb; a few minutes before its first contact therewith the black image of the shadow of II was not so conspicuous as it had been, for I picked out the bright image of the satellite before seeing the dark shadow. I was using a power of 150 diameters.

About the time of the first contact of III, the sky became slightly hazy and I did not get the time of the contacts of the shadow with the planet's limb. After the shadow of the III Satellite was on the disc of the planet, and just after the first contact of III as a white image, the image of II became too faint to be certain of my seeing it.

The haziness or light fog increased, and the planet was invisible to the naked eye, but occasional thin openings through the mist enabled me to see III and its shadow after both were certainly on the disc of the planet. For seven minutes after, the white image was brighter than the body of the planet; both the shadow and image were transiting the disc where it was moderately clear of dark lines; yet the shadow was traversing the northern edge of a faint one. In fifteen minutes after the second contact, I noted the shadow of III, but could not see the image of the satellite. At twenty-three

minutes after second contact, the shadow was clear and black, but I could make out no image of the satellite.

When the II shadow was half way across the planet, I could not see the image of II at the clearest intervals.

At forty-three minutes after the second contact of III, the shadow looked elongated; a minute later, I saw a small darkish speck where the image of III should be, and the shadow of this speck immediately suggested a balloon and its car. In place of the white image of the satellite, there was a small darkish speck, and as the seeing was difficult, I could not detect any definite form to it. This appearance continued until the satellite was nearly half way across the planet's disc. The planet was getting low down, day had broken, and the haze was increasing, so further observations were discontinued.

Several sketches were made of the planet during the transits.

THE ANNULAR SOLAR ECLIPSE OF MARCH 5, 1886.

By GEORGE DAVIDSON, U. S. Coast and Geodetic Survey.

[Davidson Observatory.]

This eclipse was only partial at San Francisco, where four digits of the sun's diameter were obscured on the south-east border.

At San Francisco the clouds broke away about an hour before the time of first contact, and the atmosphere became moderately steady at that epoch. The sun's disc was marked by three large groups of spots north of the equator, and the details of these spots became very sharply defined. The bright faculæ about the western group were plainly traced, and the rice-grain structure of the whole surface was easily made out.

The observations were made with the full aperture of the Clark Equatorial of 6.4 inches diameter, using a Herschel solar prism, and a power of about 170 diameters.

The first contact took place at 1h. 16m. 58.5s. local sidereal time, and the second contact at 3h. 30m. 21.0s. The second contact is a good observation, because it is easy to watch the narrowing, dark segment of the moon, and also because the observer can almost proportion the rate of the rapid shortening of the two cusps. This observation is within a fraction of a second. The observation of the first contact is always more or less in doubt, because the dark limb of the moon must have made its impression upon the limb of the sun before the eye detects its approach; and this dark segment is relatively long and narrow. When the border of the sun is unsteady from the disturbance in the atmosphere, the difficulty is still further enhanced. Nevertheless, I consider the observation within a second or two.

During the progress of the eclipse the images of the sun

and moon were projected upon a white background, and exhibited as in a camera obscura.

The geographical position of the Davidson Observatory is latitude, $37^{\circ} 47' 24.75''$ north; longitude, $122^{\circ} 25' 40.54''$, or 8h. 09m. 42.70s. west of Greenwich.

The phenomenon was also observed with three-inch and smaller telescopes, by Messrs. Lawson, Morse, Welker and Hill, of the Coast and Geodetic Survey.



OFFICERS OF THE ACADEMY.

1886.

President,

GEORGE DAVIDSON.

1st Vice-President.

JUSTIN P. MOORE.

2d Vice-President,

JOHN T. EVANS.

Corresponding Secretary,

SAMUEL B. CHRISTY.

Recording Secretary,

CHARLES G. YALE.

Treasurer,

ELISHA BROOKS.

Librarian,

CARLOS TROYER.

Director of the Museum,

WILLIAM G. W. HARFORD.

Trustees,

GEORGE E. GRAY,

CHARLES F. CROCKER,

LEWIS GERSTLE,

THOMAS P. MADDEN,

RALPH C. HARRISON,

JAMES M. McDONALD,

ROBERT W. SIMPSON.

Publication Committee.

GEORGE DAVIDSON,

JUSTIN P. MOORE,

JOHN T. EVANS,

CHARLES G. YALE,

EDWARD LEE GREENE.

W. CHURCHILL, Editor.

BULLETIN

OF THE

CALIFORNIA

ACADEMY OF SCIENCES.

Vol. 2, No. 6.

JANUARY, 1887.

CONTENTS.

	PAGE.
The Washoe Rocks. Geo. F. Becker.	93
Provisional Value of the Latitude of the Lick Observatory. Geo. C. Comstock.	121
Studies in the Botany of California and Parts Adjacent. V. Edward Lee Greene—	
1. Some Genera Which Have Been Confused Under the Name Brodiaea.	125
2. Miscellaneous Species, New or Noteworthy.	144
On Tetraodon Setosus, a New Species Allied to Tetraodon Meleagris Lacép.	155
Descriptive Notices of North American Coleoptera. I. Thos. L. Casey.	157
Submarine Valleys on the Pacific Coast of the United States. Geo. Davidson, A. M. Ph. D.	265
Additions to the Ornithology of Guadalupe Island. Walter E. Bryant.	269
Standard Geodetic Data. Geo. Davidson, A. M. Ph. D.	319
Early Spanish Voyages of Discovery on the Coast of California. Geo. Davidson, A. M. Ph. D.	325

ISSUED JANUARY 12, 1887.



BULLETIN.

No. 6.

California Academy of Sciences.

THE WASHOE ROCKS.

BY GEO. F. BECKER.

INTRODUCTORY.

It is well known to all who are interested in lithological geology that Messrs. Hagne and Iddings¹ have denied the validity of many of the results which I reached concerning the rocks of the Washoe district.² These geologists frankly confess that they commenced the study of the Washoe rocks with a preconceived theory which they desired to prove, and that they found my collections convenient for this purpose.³ To prove their hypothesis, however, it was essential to ignore or disprove a large part of my conclusions as to the structure of the district; for though my results were not inconsistent with their main thesis, the region could not be

NOTE ¹.—Bull. U. S. Geol. Survey, No. 17.

NOTE ².—Monograph III, U. S. Geol. Survey.

NOTE ³.—They say, page 10: "In studying the collections of lavas from the Pacific Coast volcanoes we were forcibly impressed with the insensible gradations in the micro-structure in the groundmass of rocks of the same mineral composition from a purely glassy form to one wholly crystalline, and corresponding exactly in structure to a fine-grained granite-porphry. * * * In seeking a locality in the Great Basin which could afford the necessary conditions for carrying out such an investigation as we desired to make, showing the actual transition from the glassy to the granitic structure, it was readily seen that the Washoe district was the only place offering sufficient material for the work."

8—BULL. CAL. ACAD. SCI. II. 6

Issued November 6, 1886

said to afford conclusive proof of it unless my conclusions as to structure and succession were first overthrown. This demolition they have somewhat ruthlessly attempted. During the past season I have re-examined the Washoe district with their paper in hand, but without being able to detect any substantial error in my former results. I also gathered many new facts concerning the relations of the rocks and, much as I regret being drawn into a controversy, it seems needful to call attention to these as well as to arguments not presented, or imperfectly presented in my former report. I shall be as brief as possible and deal only with the more essential points, being unwilling to contribute an unnecessary word to controversial literature.

SOME GENERAL PRINCIPLES.

Before proceeding to points which are in dispute, I desire to state certain principles concerning which, so far as I know, Messrs. Hague and Iddings would wholly agree with me. Given the chemical composition of an eruptive magma; the mineralogical results are dependent solely on the physical conditions to which it is subjected. It is not a question therefore, whether if similar magmas are subjected at different times to similar temperatures and pressures similar mineralogical and lithological results will ensue, but whether at different geological eras the physical conditions attending the cooling of eruptive masses have been substantially identical. That this has sometimes been the case will scarcely be denied. The problem with which geologists have to deal, however, is not precisely that just stated, for, since the earlier formations have been deeply eroded while the degradation of comparatively recent rocks is as a rule correspondingly small, upper portions of more recent eruptions have to be compared with lower portions of more ancient eruptions. The lithological problem is thereby greatly complicated.

The main purpose of lithology, to my thinking, is to trace

the physical conditions through which a mass of readily ascertainable chemical composition has passed. Hence, in the present state of ignorance concerning the effects of high temperatures and pressures, the most rational method is to study and record every peculiarity of every occurrence and every perceptible difference between rocks. When at some future time the causes of the observed effects are well known, it will be easy to ignore distinctions which are insignificant. If all traceable distinctions are not now preserved, however, it will then be necessary to trace them out lest significant differences should be neglected. It has never appeared to me, for example, that a distinction between pre-Tertiary and Tertiary eruptions was a natural one, but I regard it as an artificial substitute which it would be unwise to abandon, at least until some available natural principle distinguishing little eroded from deeply eroded rocks is discovered and thoroughly established.

Rocks can, of course, never be classified with the sharpness of minerals. Rocks are essentially mixtures and therefore pass over into one another insensibly. The wonder is, that rocks not only conform in some degree to a system, but that certain lithological types exhibit such an extraordinary persistence, being met with at the most remote quarters in typical development. While the very nature of the case thus excludes a rigid classification of rocks, observation clearly indicates the possibility of reducing them to a natural system.

THE PORPHYRITIC PYROXENE ROCKS.

The Issue.—Those who are familiar with the points at issue between Messrs. Hague and Iddings and myself, will readily see that the main subject of controversy is the pyroxenic rocks.⁴ In my memoir on the Comstock, I claimed

NOTE ⁴.—Mr. W. Cross' paper on hypersthene andesites was published after my lithological discussions of the Washoe rocks was ready for the press, and too late for a revision. The Washoe pyroxenic rocks contain much hypersthene, although the quantity of augite usually exceeds that of hypersthene.

that there were two separate eruptions of porphyritic, pyroxenic, plagioclase rocks, closely allied, indeed, but presenting peculiarities in structure and occurrence which made it necessary, according to the accepted criteria of the time, to separate them into diabase and andesite.⁵ Messrs. Hague and Iddings consider both of these masses literally or substantially as a single Tertiary eruption.

During the past season I have found additional reasons for maintaining the existence of diabase, and also for dividing the pyroxene andesite into two distinct outflows separated by a long interval of time.

Diabase at Steamboat.—At Steamboat Springs, at the western foot of the Virginia range, and about six miles from Virginia City, occurs an extensive series of sedimentary beds. They are for the most part in a condition of great alteration, much plicated, on the average nearly vertical, the strike following the general direction of the Sierra. Andesites and basalts have broken through them and overlie them. No trace of a fossil could be detected in these rocks. They are certainly pre-Tertiary, however, for the Miocene to the north and the Pliocene to the south (at Carson) are very differently characterized. This series appears to be at least as old as the beds determined as Jura-Trias by the geologists of the 40th parallel. These beds contain pebbles of the exact physical and mineralogical character of the most typical portion of the east wall of the Comstock lode, which I determined as porphyritic diabase.⁶ It is

NOTE ⁵.—In my memoir on the Comstock lode, it is maintained that the rocks of the district, in the order of their succession, are as follows: Granite, metamorphics, granular diorites, porphyritic diorites, quartz-porphry, porphyritic diabase, later diabase (black dike), earlier hornblende andesite, augite andesite, later hornblende andesite, basalt. It will be shown in this paper that the augite andesite would be more properly entitled pyroxene andesite, and that it is divisible into two eruptions, between which, however, no other lava is known to have been ejected.

NOTE ⁶.—As is almost invariably the case at Virginia, the pyroxenes are represented only by pseudomorphs, but these are unmistakable.

thus absolutely certain that there is somewhere in the neighborhood of Mount Davidson real pre-Tertiary diabase, not distinguishable either by definable characteristics or by those more subtle properties known as habitus from Comstock diabase. The locality in which these pebbles occur now receives the drainage from Mt. Davidson. According to my investigation of the faulting action on the Comstock, this locality formerly received the drainage from the diabase area at Virginia. Be this mentioned, however, only as evidence that the two localities are substantially in the same district. It would be impossible and is unnecessary to show that these pebbles are from the particular mass which forms the east wall of the lode. This occurrence throws the burden of proof on to anyone who chooses to deny the pre-Tertiary age of a rock which, in its characteristic exposures, has a distinctly different character from representative augite andesites.

The lithological distinctions between the porphyritic diabase, and the augite andesite of Washoe are somewhat refined, and in many cases it may be impossible from the mere study of specimens to discriminate them.

This could hardly be otherwise, for it is difficult to conceive that a porphyritic diabase could so differ from a porphyritic pyroxene andesite, that every hand specimen, or every slide could be unhesitatingly referred to its proper category. In their typical developments, however, they are distinguishable without difficulty. It may be that this is only because in the course of geological periods the older rock has been eroded to a depth at which the glassy magma had a better opportunity to crystallize and at which fluid inclusions were more readily formed, while the infiltration of waters for ages has produced, even in the freshest specimens, effects familiar to the observers of the older rocks; or the distinctions between the older and younger rock may be due to some other cause not yet elucidated. However this may be, the east wall of the Comstock, at the higher

levels, and particularly on the 500-foot level, is entirely similar to diabases of well ascertained age, while the augite andesite found over a thousand feet lower is equally typical augite andesite. Of these two types, one answers perfectly to the pebbles in the pre-Tertiary rocks at Steamboat, while the other does not. There are thus good lithological arguments, as such arguments go, for the assertion that the east wall of the Comstock is diabase, though these do not by any means complete the chain of evidence admissible.

Pyroxene Andesite at Steamboat.—There are at Steamboat Springs extensive masses of pyroxene andesite, indistinguishable from a portion of the indubitable Washoe andesites. This rock also cuts ordinary hornblende andesite in dikes at the springs, and furthermore, passes by insensible gradations and in good exposures into an extremely micaceous “trachytic” andesite in all respects similar to the later hornblende andesite of the Comstock region. The hypersthene seems to be gradually suppressed and replaced by mica, the augite at the same time yielding to hornblende. So gradual is the transition, that in some croppings of the intermediate rocks one may search for half an hour before detecting a flake of mica, and from this rock with a vanishing trace of mica to one which looks as if it contained 30 or 40 per cent. of biotite, every degree of admixture can be found. In large adjoining areas on the other hand the pyroxene andesite appears to be entirely free from mica. The exposures are so good and so extensive that there can be no mistake about these facts. At Steamboat Springs then, only six miles from the Comstock and on the same mountain range, there is certainly a pre-Tertiary porphyritic pyroxene rock in pebbles and a very recent porphyritic pyroxene lava in large masses. The latter is certainly more recent than the ordinary dense hornblende andesite.

Micaceous Pyroxene Andesites at Washoe.—Having studied

these relations at the Springs I made an examination at Washoe for purposes of comparison. On Mt. Kate, and the range of hills to the southeast of it, I detected the same transition rocks, in small quantities but distinctly developed. This range is mostly composed of a very coarse pyroxene andesite. Its structural relations had always puzzled me, for while the rock of which it is composed presents, as a whole, apparently insignificant lithological differences from the ordinary pyroxene andesite of the Comstock area, there seemed plain evidence that the main mass had been much eroded, while this range seemed to have suffered but little. It now appears to be the first portion of the series of eruptions of which the later hornblende andesite was the last, and I believe it to have been much later than the main, comparatively level pyroxene andesite area, though no eruptive rock, intermediate in age, has been detected. I may also mention that I have traced the same passage from pyroxenic to micaceous andesite at Mt. Shasta and at Clear Lake.

Messrs. Hague and Iddings recognize that my diabase preceded the older hornblende andesite. They also recognize that the later hornblende andesite was ejected long after the earlier hornblende andesite. The pyroxene andesite of the Mount Kate range, which is connected with the later hornblende andesite by transitions, must, therefore, to accord with their admissions, be younger than the rock which I called diabase. The discovery of these transitions thus leads inevitably to the conclusion that the pyroxenic porphyries of Washoe are not substantially one eruption.

Earlier Hornblende Andesite.—The relative age of the older hornblende andesite of Washoe seems to me very clear. It overlies both the diabase and the diorite in thin sheets, and Messrs. Hague and Iddings admit that it is younger than these rocks. They assert, however, that it is also younger than the mass of rock laid down on my maps as augite andesite. They are consequently compelled to

argue that in the region penetrated by the Forman shaft, a thickness of over 1,300 feet of hornblende andesite has been injected beneath an earlier mass of pyroxene andesite. This I regard as a mechanical impossibility.

Granting, for the sake of argument, the soundness of the theory of laccolitic eruptions, these can occur only where the overlying rock is coherent and tough. If a sheet of wet paper is laid on a slab of glass or marble, it is not difficult to inject beneath it a mass of water, which will simulate a laccolite. But a single pin-prick in the dome allows the water to escape and the paper to flatten. Eruptive rocks after cooling are always cracked, and they are also brittle. Laccolites cannot therefore be formed in eruptive rocks. The only remaining supposition is, that the pyroxene andesite floated upon the hornblende andesite. If solid pyroxene andesite will float upon melted hornblende andesite at all, which seems improbable, the pyroxene andesite would certainly not float high out of the melted mass, but would be almost submerged. The hypothesis of flotation, therefore, implies that the whole region was flooded with hornblende andesite to the level of the top of Mount Kate, a supposition which is entirely at variance with all appearances. I believe also that a careful inspection of the promontory of augite andesite, in which the Forman shaft is situated, on my map, including an examination of the topography, or a very hasty glance at the model prepared from the map, will lead most geologists to regard the supposition that the hornblende andesite has been injected beneath the pyroxene andesite, as highly improbable.

Conclusions as to Pyroxenic Rocks.—I re-assert, therefore, that there was an eruption of porphyritic pyroxene rock (diabase) prior to the hornblende andesite eruption, and that pyroxene andesites also followed the hornblende andesite. These pyroxene andesites appear divisible into two outflows, one of which certainly immediately preceded the later hornblende andesite, while there

seems sufficient evidence that the other eruption of pyroxene andesite was far earlier and comparatively near to the date of the hornblende andesite. It is worth noting that most of the glassy pyroxene andesite, and perhaps all of it, belongs to the eruption immediately preceding the later hornblende andesite.

DIORITE.

Not characteristically pyroxenic. — Messrs. Hague and Iddings maintain that the two walls of the Comstock are the same rock and both originally in the main pyroxenic. That in some cases the granular diorite of my report contains fresh brown hornblende, far exceeding the accompanying augite in quantity, they do not deny, but they assert their belief that in the main mass of the granular rock, containing green fibrous hornblende in irregular patches, this mineral is uraltic. This is a case in which full direct evidence is scarcely available, there being commonly no means of deciding whether the bisilicate in a particular slide is a product of the degeneration of pyroxene or of hornblende. During my last visit I collected a series of specimens with a view to testing this question on the fine exposures of the face of Mount Davidson.

In a great portion of this rock the grains are somewhat indistinct from an admixture of the minerals. In other portions equally granular, the grains are sharp and apparently free of impurities. Specimens of the latter class were selected and slides from them show that they contain unquestionable crystals of hornblende with characteristic outlines.

Porphyritic diorite. — Renewed observations were also made on the porphyritic patches of the mass. On the bare faulted surfaces of the diorite of Mount Davidson, though considerably more than 90 per cent. of the rock is granitoid in structure, there are patches of porphyritic rock surrounded by granular material, and patches of granular matter sur-

rounded by porphyritic rock. Neither one nor the other form inclusions. They resemble the dark spots so constantly found in granite and show in innumerable instances, a transition from one structure to the other. In some cases this transition is rapid though unmistakable, in others it is very gradual, so that it would be impossible to say within some inches where the mass should be called granular, and where porphyritic. In a great proportion of cases, the porphyritic portions contain hornblende recognizable with the naked eye. Under the microscope, hornblende is seen to be abundant, and augite almost entirely wanting. Now, I know of no reason to suppose that the change from a porphyry with a granular ground mass to a thoroughly granular structure is regularly accompanied by a change of the bisilicate from hornblende to augite; indeed, there is ample direct evidence that this is not necessarily the case. The inference then is strong that where these patches occur, and I know of no part of the mountain which is free from them, the mass is essentially and originally hornblendic.

Crystallization of diorite does not vary with depth.—But even if it could be shown that the granular west wall of the Comstock were of the same mineralogical composition as the east wall, as I believe impossible, it would be a necessary inference from the whole nature of the occurrence that the two rocks which I call granular diorite and porphyritic diabase are different eruptions which have cooled under wholly different conditions. The diorite is now exposed on the 3,000 foot level of the Chollar mine. It is at this point absolutely identical in mineralogical and physical character with the rock on the surface. This statement is not founded on general impressions. I gathered every variety of the diorite which was to be found on the 3,000 level, and took the specimens with me to the flume above the crop-pings. I found no difficulty in matching each of them perfectly as to structure and coarseness. The only trace of difference was in the color, which was of course a bluish

gray in the specimens from the mine and a yellowish tint where the rock was exposed to the air. It is manifest and indisputable that the west wall of the 3,000 foot level cooled under a pressure greater than the rock of the west wall of the croppings, the difference amounting to that of a vertical column of 3,000 feet of west country rock. The specific gravity of this rock is about 2.80. It is consequently certain that a pressure of above 3,600 pounds per square inch, or about 256 kilos per square cm. has produced no perceptible difference in the mineralogical or physical character of the west country rock.

Nor that of diabase.—The diabase of the 3,000-foot level is porphyritic and rather finer grained than it usually is on the Sutro Tunnel or any higher level. An additional pressure, nearly as great as in the case of the diorite, has equally failed to produce a coarser or less porphyritic character in the diabase, or, in short, to induce any approximation between the rocks. These rocks are so distinct at the 3,000-foot level that no common miner fails to see the difference between them, or to recognize the character of each and the distinction between them as the same which prevailed at higher levels. In short, there is at the lode a very sharp break in the general character of the rock.

In the effort not to burden my memoir with wearisome details, I there perhaps insufficiently described the distribution of the granitoid diabases, though I distinctly asserted that the commonest variety of the east country diabase is a fine-grained blackish-green rock. The granitoid variety is, in fact, decidedly rare, though circumstances led me to pay particular attention to its occurrences. The granitoid form is not only most likely to be confounded macroscopically with diorite, but is also least subject to decomposition and best fitted for microscopic study. It forms a very small portion of the mass.

The two rocks cannot be one eruption.—According to my

calculations, the faulting on the Comstock amounts, at this locality, to about two thousand feet vertical dislocation. If this is correct, and if the two walls are portions of the same eruption, the fine-grained diabase of the 3,000-foot level cooled under a pressure of at least one thousand feet *greater* than the coarse granitoid rock which forms the west wall at the croppings. It is also to be observed, that since these rocks are separated only by the width of the fissure, and must have been in contact before the fissure formed, it is impossible to suppose those portions of the rocks which were originally on one level subject to different physical conditions in cooling, if they originally formed parts of one eruption. It is of course open to all to doubt the correctness of my theory of the faulting on the Comstock. If I am wrong, the fault may have been greater, but I think few geologists who have studied the district would be willing to admit a fault of above three thousand feet. If the vertical displacement is supposed three thousand feet, the fine-grained diabase of the 3,000-foot level must have cooled under a pressure not less than that of the granitoid diorite west of the croppings, if the two rocks formed portions of the same eruption. On the other hand, this would involve as a consequence the assumption of an immense erosion since the fault took place, an hypothesis at variance with many observed relations. One of these is on Messrs. Hague and Iddings' hypothesis, the survival of glassy portions of the great eruption of porphyritic pyroxene rock. There being no limit to suppositions, however, any amount of faulting may be supposed. It then appears that if the texture of these rocks is a function of the depths at which they cooled, the coarseness and granulation increasing with the depth, though slowly, the amount of faulting which will account for the character actually observed must exceed six thousand feet by a distance which is indefinite but certainly enormous. This no one will maintain for a moment.

PROGRESSIVE CRYSTALLIZATION.

Observations on the surface.—Messrs. Hague and Iddings, however, claim to observe in my slides a progressive increase in the coarseness of the grain of the rocks from the contact between the later hornblende andesite with the augite andesite to the lode itself. This is a distance of about ten thousand feet. They appear to me to have been misled, and for this opinion there are various grounds. Messrs. Hague and Iddings admit that the later hornblende andesite is much later than the pyroxene andesite. The latter has, consequently, been subject to very considerable erosion. If, therefore, there is a progressive tendency in the physical character of this rock on the Sutro Tunnel level, such a tendency should also be sensible on the present surface of this rock, lying as it must considerably below the original surface. Indeed, as I shall presently show, it should afford a better opportunity for establishing their theory. I have gone over the entire surface area east of the lode, with a view to the examination of this point. I found that while the pyroxene andesite is as a whole pretty uniform, quite as much so as similar rocks usually are, it was possible in any area of a few yards square to find very considerable differences in the grain of the rock. Carrying quantities of chips about with me for comparison, I found it impossible to establish anything like a tendency in the crystallization. I examined with particular care a belt about 7,500 feet long lying directly above the Sutro Tunnel, and could detect no tendency to coarser or more uniform grain at the western edge of the pyroxene andesite area above the tunnel than near Shaft No. II, nor could I detect anything of the kind at any intermediate point.

Secondary Minerals in the Tunnel Rocks.—I have also re-examined the Sutro Tunnel which is no longer a satisfactory field for observation, being now almost everywhere timbered. I have carefully reviewed my own slides from

the adit as well as the new ones prepared for Messrs. Hague and Iddings. In the greater part of these, the groundmass, as well as the porphyritic crystals, are highly modified, and a very large proportion of the grains so carefully measured by Mr. Iddings are neither more nor less than secondary quartz. In my opinion, if his microscopic analysis of the groundmass of these rocks proves anything, it is simply that solfataric action increased in intensity as the distance from the lode decreased, an interesting result but not a new one.

Physical Conditions.—If the diabase and augite andesite formed a single eruption, the original surface may have been level. If so, there could have been no difference in pressure or rate of cooling on any horizontal line. Those who do not accept my theory of faulting on the Comstock will probably regard the east country as a single continuous mass. In that case, it is hard to see how there can have been any notable increase of pressure or retardation of cooling along the Sutro Tunnel. If the truth of my theory of the faulting is granted, the tunnel strikes the east wall of the Comstock at a point which was originally about 1000 feet lower than the eastern edge of the augite andesite. But I have already shown that an increase of depth of 3000 feet makes no perceptible difference in the character of the rock. The influence of a single thousand feet cannot possibly be traceable therefore.

The supposed eruption may also have formed a volcanic cone above the Comstock instead of a level surface. In this case, too, horizontal planes would be level or equipotential surfaces, or planes of equal pressure,⁷ and there could be no tendency induced by pressure to more thorough crystallization on horizontal lines, even if it were supposed

NOTE ⁷.—This can readily be seen by considering extreme cases. Suppose a hollow cone filled with fluid. Then of course horizontal surfaces are surfaces of equal pressure. Suppose a perfectly rigid cone; the same result follows. From these extremes any intermediate case of a viscous cone follows.

that crystallization could progress after the cones were complete though still hot. It is difficult to imagine any influence other than pressure tending to modify the character of the rock in a horizontal direction excepting the rate of cooling, which would depend upon the distance from the nearest surface. The dip of the lode is 45° , an angle greater than that of any volcanic cone,⁸ hence the rock at the lode on the 3000 foot level must have been further from the surface of the supposed cone than that at the croppings, besides being under enormously greater pressure. Since no difference tending to confirm the views of Messrs. Hague and Iddings is perceptible on the dip of the lode, it seems improbable that any could be detected along a horizontal line equally far removed from the surface.

Rate of variation of crystallization.—It is very evident from Messrs. Hague and Iddings' paper, that the rate of increase of crystallization is more rapid near the inner end of the tunnel than near the outer end. The difference in this respect between the ordinary fine-grained diabases and the diorites, supposed by them to be the same rock, is very great; while they do not claim to have found anything like so great a difference between different portions of those tunnel rocks which I regard as pyroxene andesites. Now, one cannot consider the laws of cooling and the curves and functions representing them for a moment without perceiving, that the difference of rate of cooling decreases very rapidly near the surface of a cooling body, and almost disappears at considerable distances from the radiating surface. Hence, it would seem that if the difference in crystallization is dependent on the rate of cooling, and if Messrs. Hague and Iddings have correctly interpreted the structure of the district, the rate of increase in the Sutro Tunnel should have been greatest at the eastern edge of the pyroxene andesite and nearly or quite imperceptible near the lode.⁹

NOTE ⁸.—American Journal of Science, 1885, vol. 30, p. 283.

NOTE ⁹.—It is well known that iron-blast furnace slags, which are glassy if

The present surface of the pyroxene andesite lies some 1,200 or 1,500 feet nearer the original surface than the section of it made by the Sutro Tunnel. If a cone of the rock originally existed here, it follows from the above that the surface should afford a sensibly better opportunity than the Tunnel for tracing the increase of crystallization. It offers the further advantages of more extensive exposures and far greater freedom from decomposition. As already pointed out, however, it yields no argument in favor of the theory propounded by Messrs. Hague and Iddings.

The intensity of solfataric action must approximately follow the logarithmic conduction curve which, as I showed, represents the distribution in the east country of heat emanating from the lode. So far as the observation of Messrs. Hague and Iddings on the ground mass of the rocks refers to secondary products, it thus appears in entire consonance with my investigations.

Progressive crystallization not proved at Washoe.—The case with reference to progressive increase of crystallization then stands as follows: On the line of the Sutro Tunnel the augite andesite at the surface above the tunnel has been examined for over 7,000 feet, and no tendency could be detected to any progressive change in the rock. It is difficult to imagine any conditions under which such progressive tendency (if it ever existed) would not be more marked at the present surface than in the Sutro Tunnel; or in other words, the change between the extreme ends of the line examined on the surface would be expected to correspond to the change on a longer line in the tunnel. Other portions of the augite andesite area were examined with a similar result. There is no sensible difference between the diorite at the crop-

allowed to cool in the air, are "basaltified" or converted into a tough, lithoid mass if they are run into pits and covered with a few feet of non-conducting material. Laboratory experiments, of course, prove much the same thing. In these cases the relation of the change to the distance from the surface is just what would be expected if the granulation is a simple inverse function of the rate of cooling.

pings and that at the 3,000 foot level. The distance between these exposures is about 4,200 feet. Since the pressure must have differed more for these two points than for points equally removed on a horizontal line at the inner end of the tunnel, and since the difference of distance from the original surface of these points on the dip can hardly have been less than that for corresponding points on the tunnel, a much greater difference in degree of crystallization would be expected on the dip of the lode than in an equal distance on the tunnel. Similar remarks apply to the diabase. The variation of the rate of increase of crystallization indicated by Messrs. Hague and Iddings is the reverse of that of the rate of cooling, while theory and experiment seem to indicate that these two quantities should vary in the same sense. The grains which Mr. Iddings measured are largely those of secondary quartz and perhaps other secondary minerals. These secondary crystals appear actually to increase as the lode is approached, as would be expected. The Suto Tunnel and, so far as is known, the Washoe district afford no valid proof of progressive increase of crystallization in holocrystalline rocks.

OTHER DISPUTED POINTS.

Diorites. — Although the main issues have now been treated, it appears unavoidable to make some remarks as to other points upon which Messrs. Hague and Iddings disagree with me. I have already mentioned in this paper the relations between the porphyritic diorites and the granular forms of the same rock which make it impossible to separate them. I also enlarged upon the same relation in my memoir on the Comstock. The area I have laid down as diorite is, I repeat, after re-examination, substantially one rock. If (as my opponents claim) the porphyritic diorite is hornblende andesite, then the whole mass of Mount Davidson is hornblende andesite and neither augite andesite, as they assert, nor diorite as I believe. I am not so rash as to

assert that my lines of demarcation are faultless. I can only say that they were laid down with the most scrupulous care and as the result of arduous labor, and that I know of no errors. If, however, it may hereafter prove that I have erroneously determined some slide, specimen or cropping, here or elsewhere in the district, this will not invalidate the general truth of my conclusions.

The case of the micaceous diorite is precisely analagous to that of the porphyritic hornblende diorite. Mica occurs in patches on the bare rock surfaces of Mount Davidson—here a flake or two, there a group fading out into rock in which there is no mica discoverable. These occurrences are less striking than those of porphyritic diorite in the region immediately above the central group of mines, because the presence of mica at this point is unattended by any physical or structural modification of the granitoid mass. To the north of Spanish Ravine there is an increase in porphyritic forms, both micaceous and hornblendic, but the change is very gradual, and as typical granitoid diorite occurs here as on Mount Davidson. If the micaceous rock is all later hornblende andesite, as Messrs. Hague and Iddings pronounce it, then Mount Davidson is later hornblende andesite.

“*White rock.*”—Messrs. Hague and Iddings assert that some white rocks found in the tunnel are identical with the rock called, in my report, felsitic quartz porphyry. The white rock contains no original quartz, but abundant secondary grains. It is connected macroscopically and microscopically by transition with less altered andesites. This can be shown from some of the slides referred to by Messrs. Hague and Iddings as the white rock, when compared with others which they recognize as andesites. An exactly similar case is exposed on a very large scale by the cuttings made in the hillside to gain space for the Combination Hoisting Works. Here typical hornblende andesite is intersected by a belt of solfataric action; and every imagin-

able intermediate stage, from a mass like hard, white chalk to a fresh andesite, is plainly visible on an unbroken exposure. There are other exposures in abundance on the surface. The analogy between this white rock and the felsitic quartz porphyry depends on a single specimen of the former, which shows a banded structure something like that of rhyolite, a feature which is also of common occurrence in the felsitic rock. Now, I have called attention to this structure of the east country rock in the following terms:¹⁰

“In several of the rocks a stratified or laminated structure is visible; but in the half-dozen such cases known to me, the phenomenon extends for very short distances, often only a few feet, and appears to be the result of some local variation in the composition of the rock; for not only can I perceive no general uniformity in the direction of the layers in these different spots, but I have a single hand specimen which shows two sets of them at an angle of nearly 90° to one another.”

“There are limited occurrences of excessively fine-grained, closely laminated diabase, resembling slate. The diorites and both the andesites show the same phenomenon.”

The specimen of white rock supposed to be so significant came from one of these spots, which occur not only in it but in other rocks as well. The lamination, however, is not characteristic but extremely exceptional in the white rock. The specimen is not representative, but was carefully preserved as an exception, and the peculiarity which it presents has no taxonomic value.

Quartz porphyry.—Messrs. Hague and Iddings employ this as it appears to me, wholly baseless identification, to argue that the white rock containing no quartz excepting as a result of decomposition, is a dike of rhyolite, and proves that my identification of the only quartzose rock in the district as pre-Tertiary quartz porphyry is erroneous, as well as my interpretation of its structural relations. A very large body

NOTE ¹⁰.—Geology of the Comstock Lode, pages 51 and 182.

of quartz-porphyry is met with in the mines, and is intersected by the Baltimore, Caledonia and Knickerbocker shafts.¹¹ The bottom of the Forman shaft is also in this rock. The last occurrence is referred to by Messrs. Hague and Iddings as "a small body," though of its size no one can possibly know anything. They explain these occurrences on the same intrusive theory adopted to account for the hornblende andesite in the Forman shaft. The same objections stated above, in regard to the applicability of this theory to the hornblende andesite, apply also to this case, but with still greater force; for it seems certain that andesites could not float in melted quartz porphyry. The quartzose rock, it is true, must be viscous when melted and might therefore carry up small fragments of andesite or even heavier substances, but that it could lift and support a mass of rock specifically heavier than itself and over 2000 feet in thickness I believe quite impossible.

Rock inclusions in quartz porphyry—In the hope of obtaining evidence as to the succession of the quartzose rock and the andesites which should appear to every one unequivocal, an earnest search was made last summer for included fragments, near Basalt Hill. In the augite andesite nothing could be found. This is perhaps not strange since this rock, particularly in this neighborhood, was evidently of very great fluidity. Lighter rocks would have floated upon it and would have been the first portions of the mass to be removed by erosion. Heavier rocks would have sunk to the bottom. In the quartz porphyry, inclusions of metamorphic rocks and of granite (entirely similar to that of the adjoining area, to that of Steamboat Springs and of the Sierra Nevada), were in some localities tolerably abundant. There was nothing like andesite to be found, which seems strange, if the quartz porphyry broke through the andesite carrying with it fragments of the other rocks through which it burst. This evidence, however, is only negative.

NOTE ¹¹.—See Atlas, sheet VI.

The porphyry an orthoclase rock.—Messrs. Hague and Idlings assert that there are plagioclastic as well as orthoclastic rocks among the specimens brought in by my party as quartz-porphyry. For the purpose of testing the character of the rock, large specimens were gathered at five localities in the district last summer, and separated by the Thoulet method. The localities were chosen at points as far removed from one another as possible, in order that the entire area might be represented as well as practicable by so small a number of specimens.¹² The localities are as follows: Dump of the Forman shaft; quarry near toll-gate on American Flat road; 1,500 feet south of the Amazon mine; 1,200 feet W.S.W. of Excelsior mill; 1,200 feet N.E. of Roux' ranch. These rocks are not well fitted for complete separation by the Thoulet solution, the quartz, orthoclase and groundmass coming down together in an almost continuous stream between specific gravities from 2.63 to 2.58. The material of a specific gravity exceeding 2.64 consists almost exclusively of ferro-magnesian silicates, iron ores and plagioclase. Making allowance for mixtures, it appears from the experiments that the specimens in the order named contain approximately the following percentages of plagioclase: 8, 8, 8, 1.5, 4.5. Although the orthoclase could not be separated, it is evident that the rock contains above 25 per cent. of feldspar,¹³ and that all of these specimens are to be regarded as orthoclase rocks.

That at some point or points in the district some small portion of the rock may contain an excess of plagioclase, in the nature of a local segregation, I cannot deny. The rock

NOTE ¹².—In order that no unconscious bias might affect the selection, I chose these localities on the map without visiting them, and requested my assistant, Mr. Lindgren, to proceed to the points chosen and take the specimens. He collected the freshest rock he could find at each spot, irrespective of the frequency of quartz grains. Mr Lindgren also made the separations.

NOTE ¹³.—On the quantitative composition of quartz porphyry. see Roth Allg. Geol. Vol. 2, p. 108.

as a whole, however, is much the most uniform in the district, and no such local exception to the representative mineral composition can properly affect its classification.

Fluid inclusions in quartz porphyry.—According to Messrs. Hague and Iddings, the microscopic characteristics of most of this rock are exactly the same as those of rhyolites from the Great Basin. They will not, however, deny that they are also exactly similar to those of well known pre-Tertiary rocks. These geologists seem to attach little importance to fluid inclusions,¹⁴ though I should have thought that on their own hypothesis such inclusions would be valuable as an indication of the amount of the erosion. They grant, however, that this rock contains more fluid inclusions than are usual in the later quartzose volcanics of the Great Basin. Every single slide of the quartz porphyry which I have seen contains fluid inclusions. In many cases they are extremely abundant. I have made no extensive special studies of rhyolites, and cannot therefore state how frequent such occurrences are. I note, however, that Professor Zirkel says¹⁵ of a rhyolite from the Washoe Mountains: "A remarkable phenomenon, discovered in this genuine rhyolitic rock, was a quartz which contained the most characteristic fluid inclusions." If one supposes that fluid inclusions in the quartzes of rhyolites as now exposed are so rare as they appear to be only because the deeper portions of the eruptions are not yet laid bare, then the quartzose rock of Washoe, if it is a rhyolite, is a very deeply eroded one. If it is indeed younger than the glassy augite andesites, as Messrs. Hague and Iddings maintain, and as if, as I believe with them, rocks with a glassy groundmass are found only near original surfaces, it is strange that these andesites have not been eroded as well as the rhyolite.

NOTE ¹⁴.—That I regarded the evidence of fluid inclusions as one to be appealed to with caution, may be seen from my memoir, page 50, foot-note.

NOTE ¹⁵.—Exploration of the 40th Parallel, Vol. 6, page 197.

They do not indeed state that fluid inclusions are confined to, or specially characteristic of the lower portions of rhyolite eruptions, but they do make an equivalent statement regarding the andesites, and their description of the passage from a glassy to a highly crystalline mass is couched in such general terms that I cannot doubt their holding similar views with reference to rhyolite. Of course a similar train of reasoning makes it apparently inexplicable that the surface exposures of Mount Davidson should show fluid inclusions, while glassy rocks still remain on the Mount Kate range, if the augite andesite and the diorite form substantially one eruption. There is no reason why the Davidson range should have been deeply eroded while the Kate range escaped degradation. A range may escape erosion while the valley at its base is deeply excavated, but that of two parallel ranges, distant a couple of miles, one should be deeply eroded while the other escapes almost entirely, is conceivable only under most extraordinary meteorological conditions, if at all. There are no such remarkable conditions at Washoe.

Hornblende andesite in the tunnel.—The rock laid down as hornblende andesite on my section of the Sutro Tunnel is comparatively fresh at the eastern edge. The remainder of the occurrence in the tunnel is far too thoroughly decomposed for direct determination either macroscopically or microscopically. Messrs. Hague and Iddings, however, assume that only a narrow dike of this rock is intersected by the adit, and conclude that the earlier hornblende andesite of my report is younger than any of the pyroxenic rocks. My determination of the width of this mass was not founded exclusively upon the exposure in the tunnel. The combination shaft is only 400 feet distant from the tunnel section. The top of this shaft is in the typical hornblende andesite figured in my report on plate V. Some of the stations of the shaft were accessible, and I also had access to a private collection of rocks from the shaft which were

gathered during the sinking of the shaft. By repeated study of these specimens, and by comparisons between them and decomposed portions of the hornblende andesite, near the top of the shaft on the one hand, and with diabases of the Sutro Tunnel level on the other hand, I came to the conclusion that the hornblende andesite of the surface was continuous from the top of the shaft to a point about 250 feet above the tunnel level. At this point there was a change in the character of the rock which corresponded to a similar change in the tunnel about 100 feet further east than the shaft. Through these points I drew the contact after taking all available facts into consideration. My determination of the width of the hornblende andesite in the tunnel was neither a guess nor was it founded on any theory, but was legitimately based upon the best observations which the nature of the case permitted. It is in entire accord with the results of my more recent studies at Steamboat Springs, where as has been pointed out, the earlier hornblende andesite is younger than one portion of the pyroxene rocks and older than another portion.

Dikes.—Messrs. Hague and Iddings claim that there is a dike of later hornblende andesite in the pyroxene andesite of the Sutro Tunnel. That for some distance the rock here carries some mica is unquestionable. When I first detected the presence of this mica, I believed that the later hornblende andesite was the last andesitic eruption, but the evidence on this point gathered up to that time was not so good as I desired. I should consequently have been glad to consider this a dike, and during some sixty visits to the tunnel, I examined this occurrence many times, but without being able to make up my mind that there was sufficient evidence to warrant the assertion of its intrusive character. It is true that I did not regard mica as necessarily an unfailing indication of one and only one rock, nor do I now. It may be that this really is a dike. If so, it is a very obscure case. They also maintain that dikes are very numerous

throughout the region. This I deny. It is a region where dikes should be expected, and to this fact I was fully alive. Mr. King, in his hypothetical section of the country, showed several; and Mr. Church asserted that there were at least twenty-five or fifty north and south dikes. Messrs. Stretch, Reade and I were constantly on the lookout for these important aids to geological interpretation and their almost entire absence was repeatedly a matter of surprised comment in my party. Except under unusual conditions, a dike is recognizable with the utmost ease, and very few cases could escape reasonably careful scrutiny. It is, of course, possible to interpret variations in the state of decomposition and similar phenomena as dikes on superficial examination. This has often been done at Washoe, but these cases do not stand the tests of careful study. At Steamboat, among the same rocks, real dikes are not infrequent, and the indications of their character are clear.

Lithological criteria.—I cannot but believe that Messrs. Hague and Iddings, led away by the fascination of their hypothesis, have unconsciously made a somewhat arbitrary use of lithological criteria. Because the pyroxene andesite strongly resembles the porphyritic diabase, they insist the two rocks must be substantially of the same age, notwithstanding the structural evidence to the contrary. Yet they believe that pre-Tertiary eruptions are not, as such, distinguishable from later volcanic rocks. On general principles, therefore, they would be satisfied with a moderate amount of evidence of the diversity in the age of rocks which were lithologically similar. In this particular case, however, such proof would diminish the strength of their argument for a relation between granulation and distance from a fixed point. But lithological dissimilarity does not stand in the way of their identifying rocks; for though only an infinitesimal portion of the highly decomposed andesite of the Suto Tunnel, possesses a banded structure, and though this structure, common to various rocks, is the only point of

similarity which appears to exist between this material and a quartzose felsitic mass distant over two miles, they do not hesitate to identify the two, structural evidence again to the contrary notwithstanding. While a large part of the granular diorite is, beyond question, hornblendic, and a still greater portion is of such a character that it is now impossible to say with certainty whether the green amphibole is original, uraltic, or results from an alteration of brown hornblende, they regard the whole mass as altered pyroxene rock. Yet when any specimen of this rock is found to contain mica, they pronounce it later hornblende andesite, no matter how it may be involved in the mass of their supposed pyroxene andesite. But mica is not a more significant mineral than hornblende or augite, as I feel confident from many observations. It would seem to me as reasonable to call the later hornblende andesite, diabase, because it contains some augite as to call the micaceous spots in the granular mass of Mount Davidson later hornblende andesite because they carry mica. Black dike again they identify with the very dissimilar basalt of the district. The structure and physical character of this rock are exactly similar to the commonest variety of diabase elsewhere. They state, indeed, that they have seen basalts of the same structure, but these are certainly rare, for though I have had occasion to make microscopic examinations of many basalts, I have never seen one which at all resembled black dike. The excellent representation of this rock in my memoir will enable lithologists to judge for themselves on this point. Its bearing on Messrs. Hague and Iddings' theory is manifest, for, if it is a diabase, the surrounding masses must be pre-Tertiary; but if it is basalt, it is in so far possible that the enclosing rocks may be Tertiary or later.

It is surely unnecessary to go into further detail on the subject of the Washoe rocks. I find that several of them at least, extend into the area of the Gold belt of California,

on which work by my parties has already begun, and to which my whole attention will be given for many years to come. It is not unreasonable to expect, that in the extensive area which will there be examined, some 12,000 square miles, the questions raised at Washoe will be presented, in a sufficient variety of forms, to ensure correct solutions.

Conclusions.—While I do not deny that the granular and granitoid rocks are simply those which have cooled at great depths and under great pressure, I can see no evidence at Washoe to prove it. Pressure and depth, not improbably, tend to produce the effects which Messrs. Hague and Iddings ascribe to them, but I am certain that in many cases, minute differences of chemical composition produce effects greater than differences of depth of, say, from one or two thousand feet.¹⁶

The only important changes which I feel called upon to make in the results of my former investigation of the Comstock lode are that hypersthene is present in the pyroxenic rocks, and that the area of these rocks laid down on my

NOTE ¹⁶.—An eruptive magma is probably never fluid enough to become thoroughly homogeneous, and where the products of the chemical reactions are multifarious, it is to be expected *a priori* that minute differences in composition should establish strong tendencies which may manifest themselves either in the mineralogical or the structural results. Observation also shows that cases are very frequent in which adjoining rock masses so related that they cannot have been subjected to different physical conditions, exhibit differences not otherwise to be accounted for. Easy as it is to ascertain the ultimate composition of rocks, every one recognizes that we know too little as yet of the intricacies of mineral chemistry to be able to establish a thorough correlation between the composition and the lithological results. One road to a more satisfactory knowledge of this subject appears to be presented by the principles of thermo-chemistry. I have attempted a slight theoretical advance in this direction in an article which will soon be printed. [American Journal of Science, vol. 31, 1886, p. 120]. Meantime, although it as yet impossible usefully to employ quantitative determinations so accurate as those which chemists are in the habit of making, it is most desirable that these records should be correctly kept. I pointed out in my memoir on the Comstock, that two analyses, originally published in the reports of the Exploration of the 40th Parallel, contained inconsistent data. These analyses are numbered V, and VII, by Messrs. Hague and Iddings (page 33), who

maps as augite andesite is divisible into two separate eruptions of different dates.

I affirm that the structural relations and the succession of rocks as set forth in my memoir, is substantially correct. In particular, the pyroxene andesite, diabase and diorite exposed in the Sutro Tunnel, do not form one continuous or contemporaneous rock mass, as would be necessary if this exposure were to lend any support to the hypothesis of progressive increase of crystallization. On the contrary, these rocks constitute at least three distinct eruptions, separated by long time-intervals.

I consider it possible that the quartz porphyry, although of greater age than the andesites, may have been erupted in early Tertiary times, but this I think unlikely.

Though there may be local segregations of plagioclase in the quartz-porphyry, five new separations by the Thoulet method show that it is substantially an orthoclase rock.

I think it possible, but improbable, that the black dike is basalt. In the present state of science, an absolute decision on this point is impossible.

The remainder of the conclusions stated at the close of Messrs. Hague and Iddings paper, I deny.

I conclude also that valuable as is the study of collections, inferences from them may easily be pushed too far; and that it is impracticable to elucidate the structure of a complex region from collections, however extensive.

OFFICE OF THE U. S. GEOLOGICAL SURVEY, }
SAN FRANCISCO, December, 1885. }

state that they have revised them by comparison with the original records so far as possible. This was evidently by no means superfluous. They have made four changes in V, which seems a large number of misprints in a single analysis. In VII, they have made only one correction; but the original record of this analysis must be faulty, since the sum of the items, as they give them, still fails to tally with the total. While the effect of minute variations of composition seems beyond question well marked, it is not entirely clear what effects should be expected from high pressures, the consideration of which, at once, brings up the perplexing question of the relative dynamical influence of absolute stress and stress-difference.

PROVISIONAL VALUE OF THE LATITUDE OF THE LICK OBSERVATORY.

By Professor GEORGE C. COMSTOCK.

Communicated by Captain R. S. FLOYD, President of the Lick Trustees

The following provisional value of the latitude of the Lick Observatory depends upon observations made upon four nights in August, 1886, with the Repsold meridian circle by Professor Geo. C. Comstock, assisted by President E. S. Holden, who kindly read the microscopes. All of the stars observed were selected from the star list of the *Berliner Astronomisches Jahrbuch*, and the latitude depends upon the apparent declinations of the stars as given in that ephemeris. Both the fixed and the movable circle of the instrument were read for each star, and were separately reduced. The discordances found between the results from the two circles are not greater than may fairly be attributed to division errors; the results from the fixed circle are, however, rather more accordant with each other than are those from the movable circle, indicating either inferior graduation or unstable clamping of the latter.

Each observed star furnishes a value of the reading of the circles when the telescope is pointed to the celestial equator (technically called an equator point), and the mean of all the equator points obtained during a night is taken as the equator point for that night. The circle reading corresponding to the nadir was obtained at the beginning and end of each night's observations, and the mean of these nadir points is assumed as the nadir point for the night. The agreement of the individual nadir points is fairly satisfactory, the difference between separate determinations upon the same night in no case amounting to as much as

1". The difference between the mean equator point and the mean nadir point is the supplement of the latitude.

The following table furnishes a brief summary of the results derived from the observations of each night:

Date.	Position of Instrument.	No. of Stars.	Latitude from Fixed Circle.	Latitude from Movable Circle.
1886—August 5.....	Clamp W.	7	37° 20' 24''.7	37° 20' 24''.5
August 8.	" W.	12	24.2	25.1
August 13.....	" E.	8	25.3	24.8
August 14. ...	" E.	11	25.3	25.4

The mean of the results Clamp W. is 37° 20' 24''.6; the mean for Clamp E. is 37° 20' 25''.2, showing a slight discordance between the results derived from different positions of the instrument. Such a discordance was *a priori* probable, having been found in the case of other meridian circles.

The most probable value of the latitude that can be derived from these observations, is the mean of the results Clamp W. and Clamp E.:

$$37^{\circ} 20' 24''.9,$$

which may be adopted as a provisional value for the latitude of the center of the mercury basin of the meridian circle. The probable accidental error of this result, estimated from the discordances of the individual results, is not far from $\pm 0''.10$, but the above value of the latitude provisionally assumed, may be affected by systematic errors arising from defective graduation of the circles, flexure, irregular refraction, etc., amounting in the aggregate to a considerably greater quantity.

The north dome of the Lick Observatory is twenty-seven feet north of the meridian circle, whence its latitude results from these determinations, 37° 20' 25''.2.

Mr. C. A. Schott, Chief of the Computing Division of the U. S. Coast and Geodetic Survey, has kindly communicated results for the position of this station, which have been

derived from the triangulation measures of Professor Davidson.

These are (for the dome of the 12-inch equatorial):

Latitude = $+ 37^{\circ} 20' 24''.752$.

Longitude = $+ 121^{\circ} 38' 35''.284$ (Greenwich).

Longitude = 8 h. 6m. 34.352 (Greenwich).

Longitude = 2 h. 58 m. 22.26 (Washington).

It will be observed that our determination of the latitude gives a result, $0''.4$ greater than that of the U. S. Coast Survey. This corresponds to about forty feet, six inches. The agreement between the two results is perfectly satisfactory, when we consider the small number of stars observed by us, and also that the position derived by the U. S. Coast and Geodetic Survey is not strictly definitive, as two stations (viz., Macho and Sta. Aña) require to be occupied to complete the primary triangulation in this vicinity.

STUDIES IN THE BOTANY OF CALIFORNIA AND PARTS
ADJACENT.

BY EDWARD LEE GREENE.

V.

(With Plate VI.)

1. *Some Genera which have been Confused under the Name Brodiaea.*

Of the species herein to be discussed, only five or six are presumed to be new. Many of them have long been known, and most of them have been collectively elaborated by at least two eminent botanists within a few years. There has been the widest diversity of opinion among authors regarding the limits of the genera, and the entire group is confessedly a perplexing one. Before so many as twenty species had become known, no less than thirteen genera had been either established for, or more or less replenished with them; but in the most recent pronouncement,¹ the bulk of the species, embracing at least three very good genera, as we understand them, are all disposed under *Brodiaea*. From the earliest days of my residence on this coast, where these plants are indigenous, I have regarded the arrangement placed before students and amateurs in the Botany of California, as most unnatural; and having now given five successive seasons to the study of the commonest species under circumstances peculiarly favorable to the forming of a sound and rational judgment upon them, I am now ready to offer the result of my investigations.

The Liliaceae as an order are poor subjects for herbarium study. The fabric of their flowers is delicate, being made up of a maximum of water and a minimum of permanent

NOTE ¹.—Botany of California, Vol. ii, by Sereno Watson, pp. 152-157.

tissue, and the characteristics of the filaments and their appendages, matters of acknowledged importance to the systematist, are sure to suffer obscuration, if not entire obliteration, in the process of drying under pressure. Nevertheless, almost all which has been written hitherto upon *Brodiea* and its allies has been written from the herbarium, and all our authorities upon the group are foreign authorities. No exception is to be made of botanical scholars belonging to the Atlantic side of our own continent; for they are three thousand miles distant from the habitat of these plants, and as regards facilities for acquiring familiar and thorough knowledge of the genera and species, possess little if any advantage over authorities residing at London or St. Petersburg, Paris or Berlin.

In the field there stand forth a few broad hints of generic limitation which must, I think, impress every observer. We have, for example, a group of perhaps a half dozen species whose scapes are tall and weak and either actually twining or else, by a marked tortuosity, expressing a demand for extraneous support. And there is another group, more numerous in species, whose scapes are short and rigidly erect. But the external dissimilarity does not end here. The voluble or tortuous kinds bear compact umbels of small flowers; the stiff-stalked species have loose umbels of large flowers; and, moreover, the two groups, as we for the present call them, have each its own pattern of a perianth; something in the outline of that organ which, though nearly impossible to define in words, is recognized at a glance by the botanist's eye, if he have the fresh flower before him. Now if the individual perianths of the two kinds be carefully examined, other differences easily definable reveal themselves. The weak-stalked, small-flowered assemblage of species have uniformly a thin, somewhat inflated perianth-tube with the body of which the filaments are so perfectly coalescent as to disappear from the wall of the tube altogether. In the stiff-stalked, loose-umbeled group the perianth-tube is of

firm texture and not inflated, and the filaments, stout and angular, are prominent upon the wall of the tube, down to its very base, being attached only by one of the sides or angles. This last named character I discovered in the field, but am able henceforth to trace it even in the dried specimens. In the first named group the volubility of the scapes is the most striking outward mark of a genus; but it is very apt to disappear before the specimens are ready for the herbarium; and the one unlucky species whose stalk does not altogether untwist itself in drying has, by closet botanists, been forced away from its less strongly twining relatives, and must henceforth labor bibliographically under the weight of at least four generic synonyms, of which *Macroscapa* is barbarous, *Rupalleya* and *Dichelostemma* in good form, *Stropholirion* admirably chosen, but all equally uncalled for.

The confusion of the two genera whose respective limits I have thus briefly and informally indicated, was begun by the very first author, Salisbury, to whom any of the species were known; and it was continued by his contemporary Smith. The renowned author of the *Enumeratio Plantarum* was first to recognize in the species of Smith's *Brodicea* two distinct generic types. I was long under the impression that Kunth's name, *Dichelostemma*, would have to be continued for one of these two genera. Of the priority of Salisbury's *Hookera* over *Brodicea* I was not aware until that fact was so clearly brought out, less than a year ago, by Mr. Britten, editor of the *London Journal of Botany*, and this important circumstance being recognized, it does not appear necessary to take up the name *Dichelostemma*; for, the plant which Salisbury brought forward as the type of *Hookera*, namely *H. coronaria*, being of one genus and that which Smith figured as the type of *Brodicea*, that is, *B. congesta*, representing the other, I see no reason why both these generic names ought not to be continued in use.

But, *Brodicea* and *Hookera*, as thus outlined, will include

somewhat less than one half of the species under consideration. The others have in no instance the perianth-pattern of either of those genera; are never, like them, merely triandrous; and their anthers are in no instance adnate. Along with considerable variability in the shape of the perianth, they display always six perfect stamens with versatile anthers. There is, moreover, a striking peculiarity in the way in which the filaments are joined to the tube of the perianth, and that is of the following description: the filament is slender and the upper part free, more or less; the adnate portion inconspicuous down the upper part of the tube, reappearing toward the base in the form of a thin but prominent crest. The species, however closely agreeing in habit and in the points of floral structure thus indicated, are diverse to a troublesome degree in the relative proportions of the tube and limb of the perianth, and more especially in the structure and attachment of the andrœcium. The three or four species representing the very extremes of this diversity were, singularly, those which fell first into the hands of botanists, and each of these was very naturally and, under the circumstances, quite logically taken to be the type of a genus; and so there was *Triteleia*, seeming to approach *Brodiea* by its broadly tubular perianth; *Seubertia*, in which the tube is attenuate below and the internal crests very strongly brought out; *Calliprora*, in which the cristiform reappearing of the filament quite fails, but is compensated for by an alar dilation of the upper free part of that organ; *Hesperoscordum*, in which the whole perianth is open campanulate, and the filaments dilated and monadelphous below. This last has, in my opinion, better claims than any of the others to separate generic rank. A year ago I should probably have insisted on its restoration. But the past season's collecting has yielded us a second species whose filaments are not at all dilated, but simply and singly adnate to the perianth for one half their length. Morphologically there is nothing in these two plants to keep them out of

Allium. The old species was actually referred to that genus by two celebrated botanists of Europe, each acting independently of the other. Its showy umbels very closely resemble those of the beautiful *Allium unifolium* of nearly the same habit; but *Hesperoscordum* is wholly wanting in alliaceous properties. With this group, therefore, collectively distinct as it is from both *Hookera* and *Brodicea*, I see nothing to be done but to join the whole in one under the oldest name, *Triteleia*. Against Mr. Baker's view that they are susceptible of admission to the South American genus *Milla* there appear to me some quite insuperable objections. All the South American species which he has so referred have inarticulate pedicels, different subterranean parts, and some of them at least are strongly alliaceous. We have some North American plants which seem to be exactly intermediate in character between *Brodicea* and *Milla*, namely, the two species of *Androstephium*, forming a genus whose validity has not, I believe, been called in question. It exhibits the coronated perianth of *Brodicea*, but has alliaceous qualities. Our California plant, which now goes happily, in my estimation, under Mr. Watson's name, *Muilla*, is also a connecting link between—or rather, an argument for the distinctness of—the North and South American genera. This is excluded from *Allium* only by its wanting the well-known properties of that genus, while, on the other hand, it is inadmissible to *Triteleia* by reason of its jointless pedicels.

Two other of our California genera of this alliance need to be here spoken of: *Bloomeria*, which, although it now rejoices in three well-marked species, is, I apprehend, in danger of falling into *Triteleia* through the *Calliprora* group; and *Brevoortia*, which has an inflated perianth to bring it close to *Brodicea*, and a development of the filaments at the base of the tube suggestive of *Triteleia*, but which is best

NOTE ².—*Allium lacteum*, Benth. Pl. Hartw. 339; and *Allium Tilingi*, Regel. All. Monogr. 124.

retained in generic rank, especially since a new plant from Lower California with a somewhat similarly inflated and as brilliantly scarlet colored perianth, must also be accorded a like grade, on account of the very distinctive character of its andrœcium.

BRODIÆA, SMITH *in part*.

Tube of the perianth thin and subtranslucent, campanulate or somewhat urceolate, more or less inflated and angular or saccate; segments about equaling the tube, campanulate- or rotate-spreading and often somewhat recurved. Filaments 6, inserted on the throat of the perianth, coalescent with the tube below and disappearing from its surface, developed above the insertion into petaloid appendages, those opposite the outer segments sterile, or with a half-sized anther, the other three always fertile. Anthers basifixed. Ovary sessile, or nearly so. Style stout. Stigma 3-lobed. Leaves 2, deep green, very fleshy. Scape tall, weak and tortuous, or, in several species occasionally twining under the many-flowered, compact umbel.—Smith, Linn. Trans. x. 3. excl. *B. grandiflora*; Baker, Journ. Linn. Soc. xi, 375, in part; S. Watson, Proc. Am. Acad. xiv. 236, and Bot. Calif. ii. 152, in part. *Dichelostemma*, Kunth. Enum. iv. 269; Wood, Proc. Phil. Acad. 1868, 173. *Macroscapa*, Kell., Pacific, 1854. *Stropholirion*, Torrey, Pac. R. Rep. iv. 149. t. 23. *Rupalleya*, Morière, Bull. Linn. Soc. Norm. 1863. *Hookera*, in part, of Salisb. Parad. Lond., and of Britten, Journ. Bot. xxiv. 51.

* *Fertile stamens 3; perianth-tube much constricted under the segments.*

B. VOLUBILIS, Baker, l. c. 377. Scape 4—10 feet high, in smaller plants tortuous only, in larger ones firmly twining towards the summit; perianth rose-purple, 6—8 lines long; tube 3—4 lines in diameter, hardly as long, hexagonal, the angles somewhat saccately enlarged about midway;

segments rotate-spreading, with recurved tips; fertile filaments produced behind the anthers into a pair of ligulate, emarginate appendages nearly equaling the linear-sagittate anthers, and, like the very similar staminodia, ciliate-scabrous.—*Macroscapa*, Kell. l. c.: *Rupalleya*, Morière, l. c.: *Stropholirion Californicum*, Torr. l. c. and Watson, l. c.: *Dichelostemma Californicum*, Wood, l. c.

Of rather extended yet well defined habitat, being found exclusively among the foothills on either side of the Sacramento valley, but not crossing either divide of mountains; thus ranging northward and southward for a hundred miles. The figure in the Pacific Railroad Report is not very accurate, for the angularity of the tube of the perianth is not at all brought out; but this may be owing to the fact of the artists having only dried specimens to work from; and in such this character is not apparent. The scape is also wrongly represented, twining as it were evenly and regularly, like that of a *Convolvulus*, for almost its whole length, a condition not likely to be found in reality. The plant inhabits the outer borders of thickets and also the open grounds adjacent to bushes. The scapes commonly grow erect and independent of foreign support, and remain so until toward the time of flowering; then a short coil of a few very abrupt turns is made just below the umbel around some more or less horizontally projecting branch or twig. This is the condition of tall and luxuriant specimens growing near small trees and shrubs. Those farther off from such extraneous supports twine in like fashion about each other, or if entirely isolated, do not twine at all. All the other species, except *B. congesta*, which has its own peculiar mode of taking hold of bushes, are occasionally twining; this one almost universally so. There is therefore no difference in habit between this and the other species, and Mr. Baker's transference of it to this genus is one of the good points which in his elaborate monograph, he has made with

respect to our Californian species. I may add, that in respect to color, *B. volubilis* is commonly rose or nearly white, but not rarely exhibits the violet shade which predominates in the genus. Its flowering season is from early in May to the middle of June.

B. MULTIFLORA, Benth. Scape 2—4 feet high, scabrous under the umbel, tortuous or occasionally twining as in the last: perianth deep violet-purple, 8—10 lines; tube narrowly constricted above, twice as long as broad, shorter than the spreading segments: staminodia obtuse, entire, little exceeding the oblong, deeply bifid anthers.—Pl. Hartw. 339; Baker, l. c. 154; *B. parviflora*, Torr. & Gray, Pac. R. Rep. ii. 125; Wood, l. c.: *Hookera multiflora*, Britten, l. c.

From central California to Oregon, in the mountains only, at least in California. Mr. Watson's remark in the second volume of the Botany of California, that the present species flowers a month or two earlier than *B. congesta*, evinces entire lack of knowledge on the part of his informants. *B. multiflora* is the latest of all species, being found in good condition of flower as late as July. It is considerably later than *B. congesta*, which is next to it in tardiness.

B. CONGESTA, Smith. Scape 3—5 feet high, flexuous, but apparently never twining: flowers blue-purple, in a dense capitate raceme: perianth as in the last species: staminodia bifid, spreading with the limb of the perianth, and purple, as in no other species. Trans. Linn. Soc. x. 3. t. 1; Baker, l. c.; Watson, l. c.: *Dichelostemma*, Kunth. Enum. iv. 470; Wood, l. c. 173: *Hookera pulchella*, Britten, l. c. in part, not of Salisb.

Central California to the borders of British Columbia, in open or wooded places among the foothills, flowering in May and June. The figure in the Transactions of the Linnean Society was apparently taken from a specimen not well developed, and does not indicate that distinctly racemose character of the inflorescence which Mr. Watson supposes to be

exceptional, but which we see every year hundreds of luxuriant specimens know to be universal. This, like *B. volubilis*, attains its best development when growing in the edges of thickets where its tall scapes obtain their needed support by taking a zigzag course up among the branches of the bushes. It is a peculiar species in this respect, and more peculiar still in the racemose inflorescence.

** *Fertile stamens 6.*

+ *Perianth-tube constricted above.*

B. PULCHELLA. Scape 2—4 feet high: flowers umbellate: perianth as in *B. congesta*: appendages of filaments erect or somewhat convergent over the anthers. *Hookera pulchella*, Salisb. Parad. ii. t. 117; Britten, l. c. excl. syn.: *B. congesta*; *B. capitata* in part of several authors (?).

The plant which I here quite confidently take for the real *Hookera pulchella*, has not been long known to me; but I had named and diagnosed it as a new species before having seen the figure in the Paradisus. It is distinguishable from *B. congesta*, with which it grows, by its umbellate inflorescence and hexandrous flowers, and from *B. capitata* by its differently shaped perianth and æstival flowering season, that species being early vernal. Its existence, as a species, is certified to me, first, by my own field observations and comparisons, made at Berkeley, where it grows and flowers with *B. congesta*, or even a little later than that, and fully six weeks after *B. capitata* has passed out of the field. I have also a single specimen from the Yosemite Valley, obtained late in June, 1886, by Miss Brunton. The hexandrous character of Salisbury's plant has been a stumbling-block in the path of all authors from his own time down to the present; for every one has inferred from the close, indeed quite perfect, similarity of the perianth, that this and Sir J. E. Smith's *B. congesta* were identical; but that is plainly triandrous. Salisbury himself, believing them to be the same, was able to reconcile in his own mind the dis-

crepancy by a supposition that three of the anthers were deciduous. He says he has observed that to be the case. Our field studies reveal no tendency even, to anything of that kind. Kunth, in the *Enumeratio*, supposes the hexandrous representation in the *Paradisus* to be an error of the artist. Perhaps this learned author did not read English, and so, failed to be instructed by Salisbury's verbal testimony to the faithfulness of the figure in this respect. It is a very interesting piece of information, that which Mr. Britten has given us in a foot-note appended to his valuable article that, among the original specimens of *B. congesta* collected by Menzies, he finds one whose difference from all the others had not escaped the keen perception of Robert Brown, who marked it "Distinct and hexandrous." This specimen will most likely prove to be of the present species; for, as I have already said, this grows with *B. congesta* and flowers at the same time. A collector would naturally obtain the two at once, and at a season of the year when the other common and well known hexandrous species would be long out of flower. The plant which Professor Wood saw at Yreka, in the northern part of the State, "Growing with the other [*B. congesta*], readily distinguished at sight," must have been this and not *B. capitata*, which, apart from its far earlier flowering, does not grow so far to the northward, to my knowledge.

÷ ÷ *Perianth-tube funnelform, not at all constricted above.*

B. INSULARIS. Scape 3—5 feet high: leaves often a yard long and an inch broad: bracts elliptic-lanceolate, acuminate, scarious, tinged with purple and marked by dark veins; umbel elongated: perianth light purple, ten lines long; tube about 4 lines; segments ovate-oblong, obtuse, campanulate, not recurved: appendages of filaments erect, not convergent.—*B. capitata*, Greene, Bull. Cal. Acad. i. 227, not of Bentham.

Islands off the Californian coast, from San Miguel to Gua-

dalupe. Closely related to the next but many times larger; best distinguished by the elongated umbel, of which the central pedicels are longest and the outer gradually shorter, giving the cluster the peculiar configuration of the raceme of *B. congesta*; indeed, the pedicels need only to be united, and then we should have a repetition of the inflorescence of that species. The corms are the largest in the genus, often two inches in diameter; and those brought from Guadalupe and grown at Berkeley flower simultaneously with *B. congesta*, many weeks later than the species to which, morphologically, it is nearly related, namely—

B. CAPITATA, Benth. Scape 6—18 inches high; leaves nearly as long, 3—6 lines wide: bracts elliptic-oblong, obtuse or acute, herbaceous and, in California, of a rich dark violet-purple: pedicels unequal but the outer elongated, not the inner, forming a loose, broad umbel: perianth as in the preceding, but smaller: corona connivent over the anthers. —Pl. Hartw. 339; Watson l. c.: *Milla*, Baker. l. c. 381: *Dichelostemma capitatum*, Wood. l. c. in part, doubtless.

Central California to Utah and New Mexico and southward to the northern districts of Mexico, flowering from January to April. In the vicinity of San Francisco, hillsides may be found empurpled with it in early March. It commonly grows in masses, on very open stony ground, the weak scapes often twining about one another for mutual support. In this species alone are the umbels occasionally compound, the elongated outer pedicels becoming true peduncles, each bearing its bracted umbel within the common spathe. The figure in the Botanical Magazine, t. 5912, does not fail to illustrate the dark, almost metallic beauty of the bracts which is a fine peculiarity of this species, at least in California; but the stamens are wrongly represented as exposed by an open corona, whereas in nature the parts of it are sufficiently convergent to hide them.

HOOKERA, SALISBURY *in part*.

Tube of perianth firm and opaque, turbinate or somewhat urceolate, but never at all inflated or saccate: segments equaling the tube, campanulate- or rotate-spreading, the tips often recurved. Filaments 6, stout and 3—4-angular, not coalescent with the perianth-tube, but coherent with it by one side or angle and remaining prominent down to its base, 3 antheriferous and the alternate 3 bearing white, petaloid lamellæ. Anthers basifixed. Pistil as in the preceding genus. Scapes shorter, more rigid, never twining or tortuous. Umbels loose and mostly few-flowered, the pedicels elongated and firm.—Parad. Lond. ii. t. 98; Britten, Journ. Bot. xxiv in part. *Brodicea*, in part, of Smith, Baker, Watson and others.

H. CALIFORNICA. Scape 2 feet high, stout and somewhat scabrous: leaves a foot or two long, a fourth of an inch broad, flattened: pedicels 10—25, 2—3 inches long: perianth $1\frac{1}{2}$ —2 inches, rose-color to deep purple: anthers $\frac{1}{2}$ inch long, slightly shorter than the ligulate, retuse staminodia.—*Brodicea Californica*, Lindl. Trans. Hort. Soc. iv. 84; *Brodicea grandiflora*, var. *elatior*, Benth. Pl. Hartw. 339; *B. grandiflora*, var. (?) *major*, Watson, Bot. Cal. ii. 153.

Upper part of the Sacramento Valley.

H. CORONARIA, Salisb. l. c. Scape stout, about a foot high: leaves a line wide, somewhat terete: pedicels 3—10, 1—4 inches long: perianth an inch or more long, purple: anthers 4—5 lines long, exceeding the oblong-lanceolate, mostly acute staminodia.—*Brodicea grandiflora*, Smith, Trans. Linn. Soc. x. 2; Hook. Bot. Mag. t. 2877; Baker, l. c. in part; Watson, l. c. excl. var.

The commonest species, occurring nearly throughout California, Oregon and Washington Territory.

H. MINOR, Britten, l. c. Scape very slender, 3—6 inches high: pedicels 2—6, 1—3 inches long: perianth an inch or

somewhat less, the limb rotate-spreading: anthers 2 lines long, shorter than the retuse or emarginate staminodia.—*Brodicea grandiflora*, var. *minor*, Benth. Pl. Hartw. 340; *B. minor*, Watson, l. c.

Common from the Sacramento Valley to the southern extremity of the State. Readily distinguished from the preceding, when seen in the field, by its rotate perianth-segments.

H. TERRESTRIS, Britten, l. c. Scape commonly altogether subterranean, the umbel only above ground: leaves subterete: pedicels 2—10, slender, 3—4 inches long: perianth less than an inch, the limb rotate: anthers $1\frac{1}{2}$ lines long, shorter than the yellowish emarginate staminodia, the margins of which are involute.—*Brodicea*, Kellogg, Proc. Cal. Acad. ii. 6; Watson, l. c.

From near San Francisco northward to the borders of Oregon, toward the coast. Its yellowish staminodia, with their margins rolled in, resemble true anthers but are wholly sterile.

H. STELLARIS. Scape 2—6 inches high: leaves nearly terete: pedicels 3—6, an inch or more long: perianth 10 lines long, red-purple: fertile filaments wing-appendaged behind the anther, the appendages broadly oblong, half the length of the anther: staminodia longer than the stamens, white, emarginate, their margins slightly involute.—*Brodicea*, Watson, Proc. Am. Acad. xvii, 381.

Near Ukiah, Mendocino County, discovered in 1881, by Mr. Carl Purdy, and not yet found elsewhere.

H. ROSEA. Scape slender, 3—6 inches high: leaves subterete: pedicels 5—8, an inch long: perianth 10 lines long, rose-red, the segments narrow and apparently campanulate-spreading: free portion of fertile filaments deltoid-dilated; anthers not quite equaling the white, obtuse, slightly involute staminodia: capsule short-stipitate, the cells 5—8 ovuled.

Collected at Hough's Springs, Lake County, May, 1884, by Mrs. M. K. Curran. Distinguished from *H. stellaris* by the narrower segments of the perianth, and by the deltoid filaments and the absence of appendages behind the anthers.

H. FILIFOLIA. Scape slender, 6—12 inches high; leaves linear-filiform; pedicels 3—6, $\frac{1}{2}$ —2 inches long; perianth dark blue, 6—9 lines long; segments rotate, broadly oblong; anthers sessile, 2 lines long, nearly twice the length of the triangular staminodia.—*Brodicea*, Watson, l. c.

Neighborhood of San Bernardino; collected by the Parish Brothers and by G. R. Vasey.

H. ORCUTTI. Scape stout, a foot or more high; leaves linear, flat or conduplicate, not terete; pedicels 5—15, an inch or two long; perianth-segments oblong-lanceolate, twice the length of the short tube; free portion of the filaments about two lines long, the linear anthers nearly as long; staminodia wanting (?).

San Diego county, near the city of that name, and also thirty miles to the northward.—C. R. Orcutt, 1884.

The comparatively short tube of the perianth and the elongation of the filaments are peculiarities of this species quite as remarkable as the absence of staminodia; although I do not speak positively on the last named point. I have seen only dried specimens, and shall not be surprised if an examination of the living flower brings to light some trace, at least, of staminodia.

TRITELEIA, DOUGL. HOOK. LINDL.

Tube of the perianth from narrowly turbinate to open campanulate, not inflated, angular, or saccate, longer or shorter than the segments. Stamens 6, usually in two rows; filaments slender, from almost wholly adnate, to nearly free, the free portion mostly without wing-like appendages, coalescent with the upper part of the perianth-tube, but usually reappearing strongly at base of the same, in the form

of thin but prominent crests. Anthers smaller than in *Hookera* and versatile. Ovary on a long slender stipe, or rarely almost sessile. Scapes tall and slender, but firm, not tortuous. Umbels loose, many-flowered.—Lindl. Bot. Reg. t. 1293 and t. 1635; Hook. Fl. Bor. Am. ii. 186, t. 198, B.; Kunth. Enum. iv. 465, as to the N. Am. species only; Wood. Proc. Phil. Acad. 1868, 171. *Hesperoscordum*, Lindl. l. c.; Hook. l. c.; Hook. & Arn. Bot. Beech. 400; Kunth, l. c. 464; Wood, l. c. *Calliprora*, Lindl. Bot. Reg. t. 1590; Hook. & Arn. l. c.; Kunth, l. c. 476; Wood, l. c. 172. *Seubertia*, Kunth, l. c. 475; Wood, l. c. 171. Part of *Milla*, Baker, and of *Brodiea*, Watson.

* *Perianth broadly tubular*.—TRITELEIA proper.

T. GRANDIFLORA, Lindl. l. c. Scape a foot or two high; pedicels numerous, an inch long; perianth light blue, an inch long; anthers oblong, a line long, the lower sessile in the throat opposite the outer segments, the upper on the inner segments on a short, free filament which is winged below.—*Milla*, Baker l. c. 380; *Brodiea*, Torr. Stansb. Rep. 397; *Brodiea Douglasii*, Wats. l. c.

From Oregon and Washington Territory eastward to northern Utah and western Wyoming.

T. HOWELLII. Scape 2 feet high, or more; umbel and perianth as in the first species, filaments of the lower stamens very short and deltoid, those of the upper a line and a half long, and winged broadly, the wing truncate or retuse, or nearly rounded above.—*Brodiea*, Watson, Proc. Am. Acad. xiv. 301.

First collected in Oregon, by Mr. Eddy, 1871; more recent specimens are those from Washington Territory, collected by Mr. Howell; and from these Mr. Watson defined the species.

. ** *Perianth turbinate, attenuate at base*.—SEUBERTIA.

T. CANDIDA. Scape 2—4 feet high; umbel 6—10-flowered; perianth an inch and a half long, shining white with 6 green

veins on the outside, segments equaling the tube; filaments with a slender free part which is $2\frac{1}{2}$ lines long and coiled almost or quite into a ring; anthers oblong, a line in length, obtuse at each end, fixed exactly in the middle; ovary half exerted from the throat of the perianth, on a slender stipe 8 lines long; style slender, 2 lines long, somewhat incurved; cells of capsule about 6-seeded.

Foot-hills of the Sierra Nevada back of Fresno, June, 1886. Mr. J. R. Scupham. A beautiful species, related to the next, but very distinct, with its snow-white, green-veined perianth and coiled filaments.

T. LAXA, Benth. Scape about two feet high, rigid and stoutish: umbel 10—30-flowered: perianth an inch and a half long, from light to dark violet, cleft to the middle: filaments free for a line's length; anthers ovate-lanceolate with a 2-lobed base, fixed below the middle and borne erect: ovary on a slender stipe a half-inch long.—Hort. Trans. n. s. i. 413, t. 15; Lindl. Bot. Reg. t. 1685; Hook. & Arn. Bot. Beech. 401: *Seubertia*, Kunth. l. c.; Wood, l. c.: *Milla*, Baker, l. c.: *Brodiea*, Watson, l. c.

Very common in the central parts of California, flowering in May and June, the most showy and beautiful species of the whole alliance.

T. PEDUNCULARIS, Lindl. Scape 1—3 feet high: umbel 15—35-flowered, the pedicels greatly elongated, often 6—10 inches long: perianth pale rose-purple or nearly white, about an inch long, cleft below the middle, the segments wide-spread: stamens and pistil nearly as in the last species, but the anthers nearly linear, with retuse apex.—Bot. Reg. t. 1685; Hook. & Arn. l. c. 401; Kunth. l. c. 469: *Milla*, Baker, l. c.: *Brodiea*, Watson, l. c.

From Point Tiburon, near San Francisco, northward to Lake and Mendocino Counties, also in the Sacramento Valley, growing in moist springy places, and later in its flowering than the other species.

T. BRIDGESII. Scape rather slender, a foot or more in height: umbel few-flowered: perianth as in *T. laxa*, but with a more slender tube, stamens in one row, the free portions of the filaments dilated downwards.—*Brodiea*, Watson, l. c.

A well-marked species, of somewhat limited range, apparently. We have it only from near Chico (Mrs. Bidwell), and from near the coast in Humboldt County (Mr. C. C. Marshall).

T. LEMONÆ. Scape a foot high: pedicels an inch long: perianth deep orange, 4—5 lines long, segments twice the length of the tube: filaments stout, terete, nearly equal, inserted at the mouth of the tube; anthers 1—1½ lines long: ovary short-stipitate.—*Brodiea*, Watson, Proc. Am. Acad. xx. 376.

Mountains of the northern part of Arizona.

T. CROCEA. Scape a foot or more in height: pedicels 6—15, slender, an inch or two long: perianth yellow, 7—9 lines long, cleft below the middle: anthers oblong, less than a line long, obtuse at each end, the lower nearly sessile on the tube, the upper borne on a free filament reaching the middle of the segment: ovary on a slender stipe 2 lines long.—*Subertia*, Wood. l. c. 172: *Milla*, Baker, l. c. 384: *Brodiea*, Watson, l. c.

Known only from the extreme northern part of California.

T. GRACILIS. Half as large as the last species, the leaf usually solitary, pedicels more numerous: perianth yellow, cleft below the middle: filaments subequal, the free part much elongated, carrying the sagittate acute anthers above midway of the segments: ovary as in the preceding.—*Brodiea*, Watson, l. c.

Common in pine woods of the Sierra Nevada, from Plumas to Merced Counties. Collected by Mrs. Austin, Mrs. Curran, Dr. Kellogg, Mr. Sonne, and others.

*** *Perianth tube short, the segments rotate-spreading, filaments below coalescent with the short perianth-tube, free and broadly appendaged above it.*—CALLIPRORA.

T. IXIODES. Scape $\frac{1}{2}$ —2 feet high: leaves 1 or 2: filaments of two lengths but all bifurcate at apex, the oblong anther inserted on a central cusp: color light yellow, or the anther only sometimes bluish.—*Ornithogalum*, Ait. f. Hort. Kew ii. 257; *Milla*, Baker, l. c. 383; *Brodiaea*, Watson, l. c.: *Calliprora lutea*, Lindl. Bot. Reg. t. 1590; Hook. Bot. Mag. t. 3588; Kunth, l. c. 476; Hook & Arn. l. c. 400.

Common from the southern portions of the State to Oregon.

T. LUGENS. Like the preceding in size and habit; appendages of the filaments rounded, not bifurcate, at apex: perianth deep saffron color within, exteriorly the entire tube and the broad midvein of the segments brownish black.

Collected only by the writer, on mountain summits back of Vacaville, May 4, 1886.

**** *Perianth open-campanulate, cleft below the middle, segments not rotate-spreading.*—HESPEROSCORDUM.

T. HYACINTHINA. Scape a foot or two high: pedicels 5—20, slender: perianth 5—8 lines long, white with green veins, or sometimes tinged with purple: stamens in one row; filaments deltoid-dilated and monadelphous below, attenuate above and tipped with a small ovate-oblong anther: capsule short-stipitate.—*Hesperoscordum hyacinthinum*, Lindl. Bot. Reg. t. 1293; *H. lacteum*, Lindl. l. c. t. 1639; Wood, l. c.; *H. Lewisii*, Hook. Fl. Bor. Am. ii. 185, t. 198; *H. hyacinthinum* and *H. lacteum*, Kunth. l. c. 464: *Milla hyacinthina*, Baker, l. c. 385; *Brodiaea lactea*, Watson, l. c.: *Allium lacteum*, Benth. Pl. Hartw. 339; *A. Tilingi*, Regel. All. Mon. 124.

From middle California to British Columbia; affecting moist grounds, flowering in May and June. The var. *lila-*

cina, Watson, said to inhabit Mendocino and Humboldt counties in this State, is not known to me unless it be the following very distinct species.

T. LILACINA. Scape less than a foot high: pedicels 10—15: perianth a half inch long, lilac-purple: stamens in one row; filaments not deltoid-dilated or in any degree monadelphous, coalescent with the tube throughout, free above it, and bearing the linear-oblong anthers more than half way up the segments.

Amador County, May 25, 1886, Mrs. M. K. Curran.

BEHRIA Nov. Gen

Perianth tubular, persistent, abruptly subglobose-inflated and 6-saccate above the attenuate base, thence more gradually contracted into the long, narrow, 6-toothed tube. Stamens 6: filaments filiform, free down to the base of the sac of the perianth, there abruptly dilated and united into a short crown: anthers versatile, exserted from the perianth. Ovary stipitate, 3-celled, many-ovuled: style filiform, long-exserted: stigma small, 3-lobed. Plant with the scarious-bracted umbel and slender, jointed pedicels of *Triteleia*; scape apparently tortuous or twining as in *Brodiea*: leaves and corm (?) unknown. The genus is dedicated to our excellent friend, H. Herman Behr, M. D., Professor of Botany in the College of Pharmacy of the University of California.

B. TENUIFLORA. Pedicels 8—15, very slender, an inch or two long: perianth 10 lines long, the supra-basal sac 3 lines broad, tubular portion hardly more than a line in diameter, the ovate-oblong teeth about a line long, erect or slightly spreading, brownish, apparently; whole body of the perianth bright scarlet: anthers linear-oblong, a line long, obtuse at each end, fixed by the middle, yellow: capsule ovate, a half inch long.

The umbels are all we possess of this very beautiful and interesting new ally of *Brodiea*. They are ticketed "San Jose del Cabo," which means that they are from Cape St. Lucas, or thereabouts, but the name of the collector is unknown. The fragments have been lying in the herbarium of the Academy for many years, and I had supposed, before opening a perianth that the plant would be a second species of *Brevoortia*.

2. *Miscellaneous Species, New or Noteworthy*

HELIANTHEMUM OCCIDENTALE. Suffrutescent, a foot or more high, stout and much branched; stellate-hirsute throughout except the corymbose inflorescence, which is more densely hirsute, with simple, glandular-viscid hairs: leaves linear-lanceolate, an inch long, their margin more or less revolute: inner sepals 4 lines long, ovate, acuminate, outer linear one-half as long: petals 5 lines long: stamens about 20: capsule equaling the calyx.

On a dry summit in the central part of the Island of Santa Cruz, growing there along with *H. scoparium*, which is common all over the island.

CEANOTHUS ARBOREUS. A small tree 15—25 feet high, trunk 6—10 inches in diameter, smooth, with a light-gray bark; branches soft-pubescent: leaves ovate, acute, serrate, or often rather crenate, 2—4 inches long, green and puberulent above, whitish and soft-tomentose beneath: flowers pale blue in a compound raceme: fruit not crested.

Island of Santa Cruz; common on northward slopes in the more elevated regions. The largest known species, with more ample foliage than is found in any other; always tree-like in shape, with clean trunk and open but round head, like a well-kept orchard tree; in this particular most unlike any other *Ceanothus*.

LUPINUS CARNOSULUS. Annual, not slender, 1—2 feet high, somewhat succulent, finely pubescent, with appressed

hairs: leaflets oblanceolate, an inch long, obtuse, but with a small, recurved cusp: racemes loose: bracts equalling the calyx, the upper lip of which is deeply cleft: corolla 5 lines long, deep blue throughout, keel naked: pods when young strongly villous-hirsute.

Near the village of Olema, Marin County, April, 1886.

Plant with the habit of large states of *L. nanus*, but very distinct, wanting the variegated or changeable petals and villous-edged keel of that species; the herbage fleshy as in *L. affinis*.

LUPINUS UMBELLATUS. Annual, slender and much branched, a foot or more high, canescent with a soft, villous pubescence: leaflets 7—11, only a half-inch long: peduncles slender; pedicels elongated, bearing the few small flowers in an umbellate cluster: calyx-lips narrow, the upper deeply cleft: corolla 2—3 lines long, light blue: pods 5—7-seeded.

Island of Santa Cruz, 1886.

Near *L. micranthus*, but distinguished therefrom by its dense white pubescence, small, crowded leaflets and almost umbellate inflorescence.

SYRMATIUM, Vogel.

Calyx campanulate-tubular, almost equally 5-toothed or -cleft, persistent. Petals subequal, free from the stamens: claw of the vexillum remote from the others; wings spreading; keel broad above and usually obtuse or retuse. Stamens 10, diadelphous; anthers uniform. Style incurved. Pod linear, compressed, rostrate-attenuate, falcate-incurved, 1—3-seeded, indehiscent, deciduous by an articulation of the pedicel.—Herbs or shrubs with 3—7-foliolate leaves and gland-like stipules. Flowers small, in few-flowered, bracted or naked umbels, yellow changing to red.—*Linnaea*, x. 591 (1836): *Drepanolobus*, Nutt. MS. cited in Torr. & Gray, Fl. N. Am. i. 324 (1838): part of *Hosackia*, Benthams, Torrey, Gray, and all recent authors.

In restoring this long neglected genus, I am not obliged

to rest it upon those characters alone, sufficient although they would seem to be, which were indicated both by Vogel and by Nuttall a half century ago. The indehiscent pods, promptly deciduous at maturity, are so utterly and widely unlike those of any *Hosackia* that I suppose, the character being here pointed out, there will henceforth remain less excuse than formerly for confounding the genera. It is so manifest a character to any one examining the plants in the field at the maturing of the fruit, that I wonder Nuttall, in his field-researches, did not notice it. The generic name proposed by him is more pleasing than that of Vogel, but it came into publicity after *Syrmatium*. It is therefore now of little importance that the authors of the Flora of North America, in the place referred to, did not make unmodified use of Nuttall's manuscript of *Drepanolobus*, but only employed his names and descriptions, referring the species generically to *Hosackia*. The goodly number which have been newly discovered in later years have all come out under that name, excepting the three herein first described. Full descriptions of all the rest are to be found in either the Botany of California or the Bulletins of the California Academy, that of each under the specific name here adopted.

S. DENDROIDEUM. Shrubby, erect, 4—7 feet high, with roughish brown stem an inch or two in thickness, and many short ascending branches: branchlets angular, their growing parts more or less minutely appressed-silky, the plant otherwise glabrous: leaflets three, narrowly oblong, obtuse: umbels numerous, on short peduncles, not bracted: calyx 3—4 lines long, the triangular-subulate teeth a fourth as long as the nearly cylindrical tube: corolla 4—6 lines long: pod $\frac{3}{4}$ -inch long, slightly curved, 3-seeded: seeds terete and straight.

Hill tops, among other bushes, on the higher parts of Santa Cruz Island. Near *S. glabrum*, but of entirely different habit, with much larger flowers and fruit, on short, rigid, crowded branchlets.

S. PATENS. Shrubby, like the preceding, but the stem low, and branches spreading horizontally; silvery-canescient throughout: leaflets 4—5, obovate-oblong. rather acute: umbels numerous, sessile, bractless: corolla as in the last species; calyx with very short teeth: pod 6—8 lines long, the short 1—2-seeded body nearly equalled by the slender, nearly straight beak.

Island of San Miguel, in the Cañon del Mar, but more abundant on the summit of the islet known as Gull Island, a mile or more off the shore. Of very different aspect as compared with its kindred species of Santa Cruz; and there is a difference of another kind quite as striking as any mentioned in the specific character. The Santa Cruz species was in full fruit at the beginning of July. That of San Miguel was just well in flower two and a half months later: and the two islands are not more than forty miles apart.

S. GLABRUM, Vogel, Linnæa, x. 591.—*Hosackia*, Torr. Bot. Wilkes Exp. 274; Watson, Bot. Cal. i. 137: *Drepanolobus scoparius* and *D. crassifolius*, Nutt. in Torr. & Gray, Fl. N. Am. i. 325.

S. CYTISOIDES.—*HOSACKIA*, Benth. Trans. Linn. Soc. xvii. 366; Torr. & Gray, l. c. 324; Watson, l. c. 133: *Drepanolobus*, Nutt, l. c.

S. JUNCEUM.—*Hosackia*, Benth. l. c.; Torr. & Gray, l. c. 325; Watson, l. c.: *Drepanolobus*, Nutt. l. c.

S. PROSTRATUM.—*Drepanolobus*, Nutt. l. c.: *Hosackia decumbens*, var. *glabriuscula*, Hook. & Arn. Bot. Beech. 137; *H. prostrata*, Watson, l. c.

S. MICRANTHUM.—*Drepanolobus*, Nutt. l. c.: *Hosackia*, Watson, l. c.

S. SERICEUM.—*Hosackia*, Benth. l. c.; Torr. & Gray, l. c.; Watson, l. c.

S. ARGOPHYLLUM.—*Hosackia*, Gray, Pl. Thurb. 316; Wat.

son, l. c.; *H. argentea*, Kellogg, Proc. Cal. Acad. iii. 38, fig. 8.

S. PROCUMBENS.—*Hosackia*, Greene, Bull. Cal. Acad. i. 82.

S. VEATCHII.—*Hosackia*, Greene, l. c. 83.

S. ORNITHOPUS.—*Hosackia*, Greene, l. c. 185.

S. DISTICHUM.—*Hosackia*, Greene, l. c. 186.

S. DECUMBENS.—*Hosackia*, Benth, l. c.; Hook. Fl. Bor-Am. i. 34; Torr. & Gray, l. c. 324; Watson, l. c. 138, excl. var. (?) *Nevadensis*: *Drepanolobus*, Nutt. l. c.

S. NEVADENSE. Annual, diffusely procumbent, the slender branches 1—3 feet long: sparingly villous or somewhat tomentose: leaflets 3—5, small, cuneate-obovate: umbel on a short peduncle and with a unifoliate nearly sessile bract: calyx a line long, the slender teeth a half-line: pod $2\frac{1}{2}$ lines, strongly incurved, yielding a single curved seed.—*Hosackia decumbens*, var. (?) *Nevadensis*, Watson, l. c.

Common from Donner Lake and Yosemite to the eastern borders of Nevada.

S. TOMENTOSUM, Vogel, l. c.—*Hosackia*, Hook. & Arn. l. c. 137; Torr. & Gray, l. c.; Watson, l. c. 139: *Drepanolobus lanatus*, Nutt. l. c.

S. HEERMANNI.—*Hosackia*, Dur. & Hilg. Pac. R. Rep. v. 6. t. 4; Watson, l. c.

S. NIVEUM. Suffrutescent, a foot high, white, with a villous-tomentose pubescence: leaflets 5, obovate or oval, acute: flowers capitate, the head nearly sessile, bractless; corolla 4 lines long, little exceeding the calyx of which the equal, filiform teeth are as long as the turbinate tube: pod 1-seeded, very short, wholly included in the calyx.

Island of Santa Cruz on exposed rocky slopes, but nearly extinct. The few specimens collected do not at all indicate the shrubby character of the species; for they are young seedling plants of perhaps the second year, just beginning

to show their first flowers, and were found in the sandy moist bed of a deep ravine, out of reach of the sheep. The remnants of a few of the parent shrubby plants were afterwards discovered on the rocky summit above.

HEUCHERA MAXIMA. Caulescent, the stout, fleshy decumbent branches 1—2 feet long and nearly an inch thick, leafy throughout: leaves round-cordate, 3—6 inches in diameter, with 5 shallow lobes and large rounded, but abruptly slender-pointed teeth: petioles and leafy peduncles stout, of about equal length, hirsute: thyrsus narrow, 8—12 inches long: calyx white, 3 lines long, acute at base: petals minute, white.

Rocky steeps near the sea, on the northward slope of Santa Cruz Island. An enormous species of *Heuchera*, the stout caudex-like stems more or less reclining, often fully two feet long, and many of them from the same root; simple or with suberect branches, all having numerous axillary, leafy peduncles which are rather short, the thyrsus alone rising higher than the leaves.

LYONOTHAMNUS ASPLENIFOLIUS, Greene, Bull. Cal. Acad. i. 187.

Having been favored with an opportunity of visiting the island where this interesting tree is endemic, I wish to add here a few remarks concerning it. The fruit, which in the latter part of July was found nearly mature, is assuredly that of a Saxifragaceous rather than a Rosaceous plant, consisting as it does of a pair of follicles rather than a two-celled capsule: and so the opinion of Professor Gray as to the ordinal place for the genus is well confirmed. But the flowers are altogether indistinguishable from those of the Rosaceous genera *Vauquelinia* and *Heteromeles*. The tree is no rarity on its native shore. There are a hundred fine groves of it distributed up and down the thirty miles of the island's northward slope, individual specimens often as high as thirty-five and forty feet. The wood, close-grained

and hard, is called "iron wood" by the men on the island. No other small tree of our coast equals this in grace of form and beauty of foliage. The flowers, too, are quite showy in their season, the larger corymbs often measuring a foot in diameter. Plate VI is from a pen-tracing of a branchlet and fruit-cluster made by Dr. Kellogg.

GALIUM BUXIFOLIUM. Shrubby, two feet high, erect and compactly branching: branches sharply quadrangular, the uppermost subdivided into innumerable, short, slender, very leafy branchlets: leaves coriaceous, evergreen, the lowest in fours, those of the branchlets in pairs, all obovate-oblong, acutish, tapering to a short petiole, 4—8 lines long, sparsely scabrous on the margin and along the midvein beneath: flowers unknown: fruit dry, minutely hispid, short-pedicelled, solitary, terminal and axillary.

On rocky shelves in a deep ravine near the sea, Island of Santa Cruz; also a single plant in a similar locality on San Miguel. A beautiful species and a rare one.

MATRICARIA OCCIDENTALIS. Annual, glabrous, scentless, robust, $1\frac{1}{2}$ — $2\frac{1}{2}$ feet high, corymbose-paniculate above: leaves 2—3-pinnately dissected into linear segments: heads discoid, 6—8 lines high, bracts of the involucre oblong, a line and a half long, scarious-tipped: corolla 4-toothed: akenes sharply angled, and with a broad coroniform margin a little below the summit: receptacle somewhat fusiform.

In grain fields of the lower San Joaquin and Sacramento region, collected by the writer in May, 1886, near Byron and at Elmira and Vacaville. I have seen this plant in earlier years, but was wont to pass it by unexamined, supposing it to be some species introduced from the old world, its restriction to cultivated fields of wheat and barley suggesting the idea. But on inspection I find it a very near relative of our American *M. discoidea*, distinguishable from it, indeed, more by its different habit and size, lack of fragrance, and its late flowering than by any striking charac-

ters of flower or fruit. The better known species, common in all parts of the country, and although a low and homely weed, always pleasing with its delightful fragrance, is quite past its season and nearly dead when the larger is beginning to develop its large heads. It is, moreover, a puny dwarf compared with the new plant.

BÆRIA (DICHÆTA) BURKEI. Erect, slender, freely branching, 1—2 feet high, slightly hirsute-pubescent: leaves pinnately parted into long, linear lobes: bracts of the involucre 10—12; rays as many and conspicuous: pappus of 8—10 minute, entire, acute paleæ and a single slender awn which is nearly twice as long as the akene.

Near Ukiah, Mendocino County, common in moist fields, flowering in June. Collected by Mr. J. H. Burke.

Species well marked by its large size, and peculiar pappus, although closely allied to *B. Fremonti* of the valley of the Sacramento.

CNICUS FONTINALIS. Two feet high, robust, with widely spreading branches ending in middle-sized, nodding heads: stem and upper surface of the broad, pinnately-parted leaves glandular-pubescent: bracts of the involucre imbricated in many series, herbaceous, broad, squarrose-spreading or reflexed, abruptly acute, with a short spinose tip and no viscid or glandular spot: flowers dull white: anther-tips triangular, acute.

At Crystal Springs, San Mateo County, growing among the various springs and streamlets at the north side of the reservoir from which San Francisco is supplied with water. A rather surprising spot in which to find, at this late day, so large and conspicuous a plant unknown to botanists. The entire physiognomy of the plant, so to speak, is peculiar; but its low stature and stout branches recall the common *C. quercetorum*, which, by the way, is abundant on grassy, stony knolls just above the springs. The ample recurved bracts are the most singular characteristic of this excellent,

perhaps quite local, new thistle. The root is, as in all our native species, biennial.

STEPHANOMERIA TOMENTOSA. Annual, stout, 3—5 feet high, paniculate above the middle, white-tomentose throughout when young, the inflorescence glabrate: lower leaves spatulate in outline, runcinate-pinnatifid, upper lanceolate, nearly or quite entire: heads 3—4 lines high, closely ranged along the upper half of the virgate branches, 5—8 flowered; ligules pale pink: akenes rugose-tuberculate between the five angles: pappus white, of about twenty distinct, fragile bristles, which are plumose to the base and deciduous.

Central parts of the Island of Santa Cruz, but not common.

MALACOTHRIX INDECORA. Annual, diffuse, forming a mat 2—5 inches deep and twice as broad: leaves very thick and succulent, oblong-lanceolate, pinnately lobed, the lobes obtuse: involucre 3 lines high, inner series of scales linear-lanceolate, herbaceous and green, the outer successively shorter and purple: ligules short, greenish yellow: akenes a half line long, 5-angled and 2—3-striate between the angles: pappus with no exterior bristle, wholly deciduous in a ring, the bristles barbellate above, ciliolate below the middle: receptacle naked.

MALACOTHRIX SQUALIDA. Annual, 8—12 inches high, with stout branches from near the base: leaves not succulent, lanceolate, laciniate-pinnatifid, the segments and their teeth acute: involucre a half inch high, its imbricated scales pale green with dark midveins and tips: akene less than a line long, angled and striate as in the preceding: pappus wholly deciduous in a ring, the bristles retrorsely ciliolate at base, barbellate-scabrous above: receptacle with minute paleæ.

The two plants above described inhabit together two or three execrable islets, nesting places of innumerable cormorants and gulls, close by the northern shore of Santa Cruz Island. Similar as to the technicalities of akene and pappus,

they are very distinct species, and, in appearance, not much like their nearest relatives, *M. foliosa* and *M. insularis* of other islands lying to the southward. They have not comeliness or even cleanliness to recommend them, yet make a valuable accession to an interesting genus; but the following may perhaps be reckoned a still more welcome discovery, or rather, rediscovery.

MALACOTHRIX INCANA, Torr. & Gray, Fl. N. Am. ii. 486; Gray. Bot. Cal. i. 434; Syn. Fl. 423. Scanty specimens were obtained by Nuttall, just fifty years ago, on an "Island in the Bay of San Diego," and no more has been seen or heard of the species until this year. A *Malacothrix* answering perfectly to the description published is abundant on San Miguel, the smallest and remotest of the Santa Barbara group of islands. But I met with it first on the western extremity of Santa Cruz, where it was growing in small quantity, on a shaded sandstone terrace a little above the beach.

CALAIS CLEVELANDI.—*Calais Parryi*, Greene, page 49 of this volume, not of Gray.

Dr. Parry has shown me that my plant described in the last number of the Bulletin cannot be the species so named by Gray. I had entirely overlooked the statement of that author, that, in *C. Parryi*, the awns are twice or thrice longer than the paleæ; and I here dedicate what now appears plainly a new species, to my esteemed friend, Mr. Cleveland of San Diego, who was I think the first collector of it.

DOWNINGIA CONCOLOR. Slender, diffusely branching, 4—6 inches high, minutely puberulent under a lens: tube of the corolla turbinate, nearly as long as the limb, cleft from the base of the upper lip one third of the way down; lobes of the upper lip lanceolate, deflexed and appressed to the sides of the tube: flower blue throughout, the central part of the lower lip dark, surrounded by a narrow border which is paler than the deep sky-blue of all the other parts.

In a wheat field near the village of Suisun, May 2, 1886, growing with the common species, each plant forming a compact, well rounded mass altogether intensely blue with an extraordinary profusion of flowers. The other three species already recognized are almost impossible to distinguish, in herbarium specimens, but this, even when dried, looks very different from those. Its cleft corolla-tube is a new and unwelcome character, too much like *Lobelia*.

ON TETRAODON SETOSUS, A NEW SPECIES ALLIED TO
TETRAODON MELEAGRIS LACÉP.

BY ROSA SMITH.

Length 12 inches (14 inches to margin of caudal fin); depth, inflated, 6 inches. Head 4 ($4\frac{2}{3}$); orbit 4 in head. Snout about 3 in head (measuring to front of orbital bone), the upper profile abruptly concave behind lip. Interorbital space moderate, one and a-half times diameter of orbital bone. The eye itself seems to be drawn backward from its proper place in the orbit and has been stretched out of shape in drying. Orbital ridges not greatly elevated, the interorbital region nearly flat.

Body everywhere thickly beset with short, slender, stiff spines, except around mouth, at bases of fins and around vent; these spines or bristles averaging one-eighth of an inch in height, their insertion in the skin not quite so far apart as their height. The spines are nearly uniform everywhere. Some of them show no lateral roots, while many are from two- to five-rooted, giving the skin a stellate appearance. About seventy spines from eye to dorsal fin, but the spines are thickly scattered without being in regular rows. The smooth area about the mouth is two-thirds diameter of orbit. The dorsal and anal peduncles are wholly smooth and the caudal peduncle has spines only at its base, which are recumbent and mostly imbedded in the skin.

Caudal fin subtruncate, one-half longer than caudal peduncle, the base of the fin entering twice in its height. Base of dorsal fin two and a half times in its height; margin unevenly rounded. Base of anal one and three-fourths in height, the fin rounded posteriorly. Pectorals truncate, one-fourth higher than broad.

Color dark brown, everywhere with roundish white spots, most of them one-eighth of an inch in diameter, equal to or exceeding the pupil; these spots coalesce on the ventral surface, forming vermicular markings, which usually are wider than the brown interspaces; the dorsal dots are narrower than the brown ground between. All the fins similarly spotted, though the spots are smaller than on the body. No streaks nor black marks anywhere. Pectoral and dorsal fins with a white edge as wide as the dorsal spots. Anal fin very narrowly margined with white.

This description is made from a dried skin in fine condition which came from Mexico. The specimen is now in the collection of the California Academy of Sciences, and bears the registered number 2,996.

October 30, 1886.

DESCRIPTIVE NOTICES
OF
NORTH AMERICAN COLEOPTERA.

I.

(With Plate VII.)

BY THOS. L. CASEY.

Read Oct. 18th, 1883.

Under the above title it is intended to publish short studies, either of species or small groups of genera, which may from time to time be investigated in a detached and desultory manner. Care will be taken, however, to indicate the relationships wherever possible and whenever these are at all obscure, so that it is hoped no confusion will be introduced into our already overburdened nomenclature. Large and complicated genera, or those in which the species are very closely allied and difficult of recognition, will not be touched upon except under very peculiar conditions, as these should form the subject-matter of separate essays.

In this connection it may be stated that it is my intention to include, if possible, within the faunal region considered, the entire North American continent terminating on the south in the isthmus of Panama and including the islands of the West Indian archipelago, as this appears to constitute a more natural region than that which is limited on the south by the Mexican boundary of the United States.

The present paper contains descriptions of new genera and species, mostly from the Pacific Coast, but with a few from

other portions of the continent; they are, in addition, principally members of the clavicorn families Pselaphidæ and Staphylinidæ.

In the latter family there seems to be considerable confusion in regard to the estimation of the number of abdominal segments, and having recently seen some remarks by M. H. Jekel (Col. Jk. Eleuth. Bibl., p. 22-23), which set forth the subject very clearly and fully, I take pleasure in transcribing them as follows:—

“Une autre cause d’embarras très sérieux pour les étudiants est l’instabilité—ou plutôt la non-concordance des auteurs dans l’énumération des segments abdominaux. Erichson avait parfaitement reconnu l’existence des deux pièces du dos situées entre le metanotum et les segments normaux de l’abdomen—visibles et découverts seulement chez un petit nombre de groupes où les elytres n’atteignent pas l’extrémité des épimères metathoraciques—et il avait prévenu ses lecteurs que, pour éviter des erreurs, il ne compterait les segments du dos qu’à partir de—et avec—celui qui se présente comme premier en dessous, et dont la texture est semblable en dessous comme en dessous aux suivants et fait corps avec eux, et offrant la même consistance. En cela il fut suivi—comme il avait été précédé—par un grand nombre d’auteurs recommandables. Plus tard les uns n’ont voulu compter qu’une seule de ces deux pièces dorsales ‘*interthoracico-abdominales*,’ regardant l’une d’elles comme un faux-segment à cause de son étroitesse et de sa consistance membraneuse; d’autres la comptent aussi, de sorte que nous sommes en présence de trois systèmes, de sorte que le segment anal est pour les uns le 6^e (la plupart des auteurs jusques et y compris Erichson, Fairmaire etc), pour d’autres le 7^e (Kratz, G. Thomson etc), pour d’autres enfin le 8^e (Pandelle etc).

“Tout en constatant l’existence des deux pièces dorsales en question,—dont la consistance est si différente de celle des autres segments, et qui ne se détachent pas du thorax lors de la rupture de l’abdomen—elles ne devraient pas être comptées comme abdominales dans les travaux descriptifs des espèces, d’autant plus que les auteurs qui les comptent n’en parlent jamais dans leurs descriptions—et pour cause—ces minces filets semicoriaces, semimembraneux n’offrant aucune modification de forme ou de sculpture appréciables, lorsque, par exception, ils sont découverts par la brièveté des élytres. Enfin, même dans ce cas, leurs analogues ne se présentent pas en dessous cachés qu’ils sont par les épimères, le metasternum etc. Dans cette illogique situation on se trouve avoir un ou deux segments de plus—selon la fantaisie des auteurs—en dessus qu’en dessous de l’abdomen, 6 ventraux et 7 ou 8 dorsaux *ad libitum*.

“N’eût-il pas été préférable, pour la compréhension de tous, de s’en tenir au sage conseil et à l’exemple d’Erichson, dont la judicieuse logique n’amenait aucune perturbation dans les errements antérieurs, basés sur la parité

des segments extérieurement appréciables et conformes en dessus comme en dessous? Que l'on nous prouve, comme question d'anatomie générale et transcendante et technique des Staphylinides, qu'il y a 8 pièces, 10 même (Pand. Ann. Soc. Ent. Fr. 1869, 265) en dessus de l'abdomen, cela est fort bien, mais ceci une fois établi n'énumérons pas dans des descriptions qui doivent être claires et compréhensibles pour tous, et n'assimilons pas aux véritables segments abdominaux ces annexes metathoraciques *qui s'arrêtent au niveau des épimères du metasternum, et qui font corps avec lui*

"Je previens donc que j'en reviens à l'ancienne méthode, et que, quelque soit l'allongement ou la brièveté de l'élytre, le compte des segments abdominaux se fera dans mes descriptions, à partir du premier ventral et de son correspondant dorsal, ce qui est la logique et la précision, que l'on ait affaire à un Aléocharien ou à un Omalien."

These remarks fitly convey my own views and are similar, in substance, to what I should have stated as a result of study and observation. In all my future writings the ventral segments will be counted from, and including the first as seen from below, which is the real first segment of the abdomen.

For an illustration of this structure the reader is referred to the plate at the end of the present paper, where the basal portion of the abdomen of *Hesperobium* is figured in detail. It is there seen that the first segment has at the base a raised flat margin, rapidly diminishing in length to the median carina, where it almost disappears. It is possibly this raised margin which has been mistaken by several authors for a small basal segment, partially hidden by the posterior margin of the metasternum and the coxæ.

The true significance of the basal elevation is not apparent, unless, perhaps, that it serves to form a closer joint when the abdomen is drawn up, and still allow of a certain amount of flexibility. That it is not the ventral portion of the small membranous or coriaceous posterior segments of the metanotum is abundantly proven by the fact, as shown above by M. Jekel, that these coriaceous parts do not project beyond the metasternum and do not in reality form part of the abdomen; also because the other segments are also provided with an entirely analogous raised basal

margin, and finally very conclusively by the fact that these margins also exist on the dorsal surface of the segments, being practically continuous from the ventral to the dorsal plate. The coriaceous segments merely serve to connect the abdomen proper to the metanotum, and apparently do not even extend through to the under surface of the metasternum, or at least one specimen—from which the drawing is taken—has the first ventral so far exerted from the posterior margin of the metasternum as to leave a very large extent of membrane exposed to view, and no signs whatever of a segmental division are visible.

Another inaccuracy mentioned by M. Jekel, is in regard to the measurement of length in the Staphylinidæ, where the abdomen is often extended. This is not, however, of so great importance, as it is much easier to state, if the specimen be unique, whether or not the abdomen is extended, than to make minute measurements of other portions of the body. If the specimens be numerous, the lengths of extreme examples should be quite sufficient for all practical purposes.

As a source of ambiguity often observable in the writings of coleopterists, may be mentioned the variety of ideas attached to the word *epipleura*, in describing the elytra. Pascoe has alluded to this subject (Ann. Mag. Nat. Hist. Jan. 1869, p. 2), and suggested a definite meaning for the word; the notation here proposed is similar to that of Mr. Pascoe, with a single exception.

The inflexed sides of the elytra—for which I would propose the word *hypomera*—are generally composed of two parts, the first being a more or less elevated lower margin of greater or less width, and the second the remainder of the inflexed side, usually limited above by a more or less distinctly defined edge, generally reflexed. Above this the disk of the elytra is declivous, the declivity merging gradually into the dorsal and central portions of the disk, which are nearly always less convex. When the sloping sides of

the disk are very abrupt and more or less distinctly limited by a line, as in many species of *Læmophlœus*, they are designated as the *pleuræ*, the word *epipleuræ* being applied to the second portion of the inflexed sides above mentioned, and the word *hypopleuræ* to the first, or raised lower margin. This last has been called the *epipleural fold* by Pascoe; but in addition to the undesirability of two words to express our meaning where one can just as well be employed, we must consider the fact, admitted by the distinguished author quoted, that the *hypopleuræ* are not in reality folds at all. In a few of my previous descriptions I have used the word *hypopleuræ* to designate the entire inflexed sides or hypomera, but in future the names here given will be adhered to.

While dealing with kindred topics, it seems desirable to indicate the perversity of the brain in interpreting the images formed upon the retina of the eye in delineating and describing form. A good way to illustrate this is to observe the letter S in print, where the two salient curves in the ordinary position of the letter appear to be of nearly equal size; if now the letter be inverted, it will be seen at a glance that the lower portion in its former position is much the larger. In a similar way vertical lines appear relatively longer than transverse lines, and this has led to many errors in describing the shape of the prothorax; when the width and length of the latter are equal, it invariably appears at the first glance to be longer than wide, and is generally so described, thus introducing an element of confusion and doubt for those attempting to identify species from descriptions. This defect can be gradually overcome in various ways, but perhaps best by trying to delineate the form of the insect; for those who have never attempted it, this will generally be found a very difficult feat, and one requiring several attempts before a satisfactory outline can be produced.

The short diagnoses usually given are purposely omitted,

their place being sufficiently supplied by the first few lines of the descriptions, which deal with the general form, color and other similar characters, in conjunction with the general remarks usually appended in large type. In general monographic memoirs they are quite unnecessary, and merely consume space which might better be occupied by descriptive matter, because in such monographs or revisions, the key-tables, which should always be given, amply serve the purpose for which the diagnoses are intended.

It will be observed that the descriptions refer in all cases to the single specimen assumed as the type. The diversity of opinion as to the proper definition of a genus or the structural differences warranting the generic isolation of special groups, holds with almost equal force in regard to the ideas attached to the species which compose them. Forms which some coleopterists would regard as specific, are held by others to be simply racial, and by others again as merely accidental variations not even worthy of a name. This divergence of opinion must necessarily exist until our knowledge becomes more extensive, and until an approximately complete series of specimens of all species can be obtained from every region of the globe. I have preferred, therefore, in the existing state of knowledge, to describe one definite type and give such general remarks as may indicate the variation exhibited by the material at hand; additional series may alter our conception of the species to a considerable degree, but having a single typical description, we possess something tangible upon which to base the subdivisions into races or definite varieties, as may be determined by such representatives. In other words, it would produce more confusion than benefit to attempt to give a general description based upon material which must inevitably be incomplete.

It will also be noticed that the English language is alone employed in descriptions and diagnostic tables. My reasons for this course are, first, because I believe that the

time necessarily employed in learning to write the Latin language with fluency, in such manner as to be entirely certain that our ideas are being properly expressed—and it is useless to attempt it without such knowledge—might be better occupied in a study of the technicalities of the science, especially in view of the fact that there is probably no man of even moderate education possessing a good knowledge of Latin, who cannot at least understand descriptions drawn up in the three languages—French, German or English. Again, supposing a student to be ignorant of the indispensable triad of modern languages, it is easily seen that the amount of information concerning a species which he can obtain from the short three or four lines written in Latin and forming the diagnosis, is simply tantalizing. Either the entire description with all appended remarks should be written in Latin, as in the Staphylinidæ of Erichson or the Tomicini of Eichhoff, or else the student must perforce have a knowledge of these languages in order to read the description of the species, otherwise the most important part, as far as identification is concerned, or that relating to the details, is entirely lost to him. Without wishing to be considered unduly iconoclastic, it must be candidly confessed that the necessity for the latinization of the few lines usually beginning a description is not readily appreciable.

When used with a moderate amount of care, the French and English languages are very perspicuous and eminently adapted to concise scientific expression. The spirit of these languages demands simplicity and conciseness, and they are, in addition, peculiarly fitted for technical descriptions because of their power of absorbing words derived directly from the Latin and Greek. In regard to ambiguity, there are few who can maintain that they possess this undesirable quality to a greater degree than the Latin, and we may go so far as to say that they are far less ambiguous than a large proportion of the ordinary entomological Latin of the present day. The majority of our working coleopterists are com-

pelled to engage in active pursuits, either professional or commercial, which demand a knowledge of the three languages mentioned, and, if after acquiring them, these can also serve them in the scientific recreations of their leisure moments, thus rendering unnecessary the acquisition of a special language for such purposes, it appears to the writer that we have gained one very important point, since just so much time and labor may be saved for useful scientific work. Physicists, mathematicians, astronomers, and zoölogists in fields other than entomological, have long since abandoned the Latin as a medium of publication. The leading mathematical and astronomical journals employ the modern languages exclusively, and, although they appeal to a much more extensive class of readers than do the entomological journals, it has not been found that anything has been lost by the change, but on the contrary, as they at present reach a larger number of readers, such a course has tended to more widely diffuse scientific knowledge, and to create a more universal desire for its advancement.

This subject is, however, a somewhat delicate one, and merits further consideration and argument.

The binocular microscope, with objectives of from two-thirds to two inches focal length, is inevitably destined to supplant the hand-lens in the future study of entomology, its advantages being perfect steadiness of the object, sufficient magnifying power to bring all the organs prominently into view, and the healthful and unconstrained use of both eyes, giving a stereoscopic effect; at the same time both hands remain free for writing or drawing. To one accustomed to this mode of studying insects under ten mm. in length, an adherence to the usual method of research by means of the hand-lens, where the eye is unnaturally strained, and the images consequently apt to be distorted and to convey a wrong impression, seems entirely unaccountable. A long list of errors in describing sculpture and formation of various parts of the body, owing to insuf-

ficient magnifying power and other unsatisfactory conditions, could easily be given, and in this connection it must be borne in mind that it requires much more amplification and acuteness of sight and perception to discover a character or the structural nature of an object than it does to see the same after it has once been described. I allude to the use of the microscope rather for original research than for cursory observation and comparison, as these objects can be much more conveniently attained with a good hand-lens.

As greater attention is being given to exactness and perspicuity in describing the characteristics of species, a general catalogue of terms to be employed for the almost infinite variety of sculpture, punctuation, lustre, pubescence, form and color, should be compiled, each modification being illustrated by reference to a particular species wherein it is preëminent; the colors should be indicated on a lithographic plate. Such a catalogue as this would conduce greatly to uniformity in description, and therefore to ease of identification of species; it should be undertaken by a special congress of entomologists, or by some one of the large European societies, and would be of great value in systematizing the science.

In conclusion, the author begs the indulgence of coleopterists for errors, past, present and future. Having entered upon the detailed study of our smaller Coleoptera, he finds himself forced to rely in great measure upon the library, which, although undoubtedly a most trustworthy and unbiased guide, is still more or less unsatisfactory because of the insufficient and often erroneous descriptions of our earlier authors. Under such circumstances errors are unavoidable, and he trusts they may be overlooked to some extent, upon the assurance that his utmost endeavors have and will be employed in seeking the truth regardless of all other considerations.

SAN FRANCISCO, October 11, 1886.

The following is a list of the genera and species here described or brought to notice:—

HYDROPHILIDÆ.

Limnocharis picea Horn.
polita.
angustula.
alutacea.
congener.
coniciventris.

SILPHIDÆ.

Silpha ænescens.

PSELAPHIDÆ.

Batrissus mendocino.
zephyrinus.
speculum.
monticola.
occiduus.

Bryaxis texana.
infinita.

Nisa n. gen.

Reichenbachia tumrosa.
tumidicornis
informis.
gracilicornis.
nevadensis.
fundata.
franciscana.

Nisaxis n. gen.

Sonoma n. gen.

Oropus striatus Lec. n. gen.
convexus.
interruptus.
abbreviatus.

Actium n. gen.

STAPHYLINIDÆ.

Lomechusa montana.
Tachyusa crebrepunctata.
Autalia elegans.
Eumitocerus tarsalis n. gen.
Heterothops exilis.

Ababactus pallidiceps.

Lena testacea n. gen.

Ramona capitulum n. gen.

Leptogenius brevicornis n. gen.

Scopæus rotundiceps.

truncaticeps.

Scopæodera nitida Lec. n. gen.

Leptorus texanus n. gen.

bicolor.

versicolor.

longiceps.

Orus parallelus.

Apocellus niger.

Phlæopterus filicornis.

Amphichroum flavicorne.

alutaceum.

pilosellum.

veterator.

crassicorne.

Pelecomalium binotatum n. gen.

modestum.

Lathrimæum humerale.

Orobanus rufipes.

densus.

TRICHOPTERYGIDÆ.

Actidium rotundicolle.

Ptilium sulcatum.

Smicrus americanus.

BYRRHIDÆ.

Ditaphrus scymnoides n. gen.

TENEBRIONIDÆ.

Eleates occidentalis n. gen.

CURCULIONIDÆ.

Barinus squamolineatus n. gen.

SCOLYTIDÆ.

Renocis heterodoxus n. gen.

LIMNOCHARIS Horn.

The species of this genus are probably numerous in North America, although but two have been described; I now add several other peculiar forms. The genus is apparently valid, since in all the numerous specimens which I have examined, there are clearly eight ventral segments, the eighth being small and more or less retractile, so that, while in the type of *angustula* it is nearly as long as the seventh and very conspicuous, it may sometimes be almost entirely withdrawn; it is never entirely invisible, however. The labrum also differs greatly from that of *Limnebius* as described by Lacordaire, for in *Limnocharis* it is not broadly rounded, but is deeply sinuate in the middle. The antennæ have, as stated of *Limnebius* by Du Val, nine joints, the first two subanched so as to form a long slender scape.

The mentum instead of being strongly rounded, approaches in *Limnocharis* more nearly the trapezoidal form, and in the very singular *L. coniciventr*is described below, it is almost perfectly trapezoidal, being transversely truncate at apex.

The eighth segment of the abdomen does not bear a tuft of hair, but has one or two terminal setæ, perhaps according to the sex.

The species of the genus at present known from the United States are as follows:—

Sides of the elytra distinctly arcuate.

Surface more or less polished.

Prothorax very strongly transverse, at apex nearly twice as wide as long.....*picea*.

Prothorax less strongly transverse, at apex less than one-half wider than long.

Apical angles of elytra narrowly but distinctly rounded.....*polita*.

Apical angles not rounded..... *angustula*.

Entire surface more or less alutaceous.

Elytra at base slightly narrower than the prothorax; surface strongly alutaceous.....*alutacea*.

Elytra at base equal in width to the prothorax; surface feebly alutaceous; scutellum larger.....*congener*.

Sides of elytra strongly convergent, almost perfectly straight.. *coniciventr*is.

L. picea Horn.—Trans. Am. Ent. Soc., 1872, p. 144—A specimen before me from Gilroy, Santa Clara Co., appears to satisfy the description given by Dr. Horn for this species; it is, however, rather smaller and the prothorax appears to be slightly less strongly transverse than shown in the figure and described in the text; it is two-thirds wider than long at apex and nearly two and one-half times as wide as long at base.

L. polita n. sp.—Narrowly oval, strongly convex; black; legs and palpi dark piceo-testaceous; upper surface polished, with rather long, recumbent, very fine and sparse pubescence; under surface black, rather densely pubescent. *Head* one-half wider than long, feebly convex, very feebly reticulate, excessively minutely and rather sparsely punctate; epistomal suture transverse, well marked; last joint of maxillary palpi darker in color. *Prothorax* at apex just visibly wider than the head, at apex broadly and very feebly emarginate, two-fifths wider than long; base two and one-third times wider than the median length, transversely truncate, broadly and very feebly sinuate on each side of the scutellum, and very feebly and anteriorly oblique at the sides; sides feebly and evenly arcuate; disk evenly convex, very feebly reticulate, very minutely, sparsely punctate, with a transverse row of dense punctation at the apex on each side. Scutellum distinctly wider than long, sides feebly arcuate. *Elytra* at base equal in width to the prothorax; sides strongly convergent and rather strongly and evenly arcuate to the apex, which conjointly is not truncate, but rather acutely rounded; each elytron at apex rather acute and very distinctly rounded; disk strongly convex, scarcely two and one-half times as long as the prothorax, finely and very distinctly reticulate, more finely and densely so than the pronotum, not visibly punctate. *Legs* rather slender. Eighth segment with two apical setæ. Length 1.4 mm.

California; (San Francisco). Several specimens.

May be distinguished by its blackness, polished integuments and elytral structure.

L. angustula n. sp.—Narrowly oval, strongly convex, piceous-black; legs and palpi dark piceous-brown; pubescence very fine, not dense; integuments shining. *Head* one-half wider than long, feebly convex, not visibly reticulate, very minutely and sparsely punctate; epistomal suture very feebly arcuate toward the eyes; last joint of maxillary palpi scarcely at all darker in color. *Prothorax* at apex not wider than the head, broadly, very feebly sinuate, two-fifths wider than long; base transversely truncate, almost perfectly straight, two and one-fourth times as wide as the median length; sides feebly and evenly arcuate; disk not visibly reticulate, excessively minutely, sparsely punctate, with a feeble row of larger and denser punctiform subasperate erosions on each side behind the apical margin, and, near the basal margin, two small impressed punctures distant by slightly more than the width of the

scutellum. Scutellum very slightly wider than long. *Elytra* at base as wide as the prothorax; sides strongly convergent to the apex, evenly and rather feebly arcuate; apex feebly subtruncate, together rounded, each angle nearly right and scarcely at all rounded; disk slightly less than one-half longer than wide, two and one-third times as long as the prothorax, strongly convex, finely, feebly reticulate, not visibly punctate. Eighth ventral segment large, having two apical setæ; sixth broadly emarginate. Length 1.3 mm.

Texas; (Austin 1).

This species, as may be inferred from the description, is very closely allied to *polita*, but is well distinguished by the form of the elytral apices; in addition the reticulations of the elytra are finer and stronger in *polita*, and the punctuation of the pronotum is less evident in *angustula*. It may be considered unwarrantable to trust to the conformation of the elytral apices for specific characters in the Hydrophilidæ, but in the present instance there is much more probability of both the typical representations being of the same sex, than that they are not, for the eighth segment in each is large and very distinct and is provided in each with two equal apical setæ. *Angustula* is a narrower and slightly more convex species than *polita*, and has the prothorax slightly less strongly transverse.

All the species of the present genus have the two basal punctures and the two apical rows of asperities; the pronotum is, in addition, always very finely margined along the apex and sides, but not along the base, the latter being abruptly convex and narrowly declivous to the plane of the elytra.

L. alutacea n. sp.—Suboblong, moderately robust, not strongly convex, black, piceous by diaphaneity; legs dark piceo-testaceous; palpi and antennæ slightly paler; pubescence extremely fine, recumbent, not dense above; integuments alutaceous, elytra scarcely more strongly so than the pronotum. Head scarcely one-half wider than long, feebly convex, finely reticulate, very minutely, sparsely punctate; epistomal suture transverse and very feeble in the middle, oblique and almost completely obliterated at the sides; epistoma with a small discal puncture near each apical angle. Prothorax at apex slightly wider than the head, broadly, moderately and trapezoidally emarginate, two-fifths wider than long; at base transversely truncate, broadly and

very feebly sinuate at each side, two and one-third times as wide as long; sides evenly and feebly arcuate; basal angles from above narrowly rounded; disk very broadly convex, finely reticulate and subgranulose; punctures excessively minute, rather sparse and scarcely visible. Scutellum very small, twice as wide as long, parabolically rounded behind throughout. *Elytra* at base slightly, but distinctly narrower than the prothorax; sides not strongly convergent, evenly and moderately arcuate to the apex, which, conjointly is obtusely and evenly rounded, not at all truncate; inner angles narrowly but distinctly rounded; disk two-fifths longer than wide, two and one-half times as long as the pronotum, moderately convex, reticulate and subgranulose like the pronotum, excessively minutely and scarcely visibly punctate. Eighth segment having a long, robust apical style, with one or two short robust spinules on either side. Length 1.6 mm.

California; (Mendocino Co. 1).

Easily distinguished by its wider prothorax and distinctly alutaceous surface sculpture. The maxillary palpi are distinctly more slender than in the following species:

L. congener n. sp.—Narrowly oval, rather convex, black; legs piceous; pubescence fine, sparse; integuments shining, very feebly subalutaceous. *Head* feebly convex, finely, evenly and distinctly punctate; epistomal suture transverse, distinct, slightly arcuate and very fine near the eyes. *Prothorax* at apex just visibly wider than the head; proportions nearly as in *alutacea*; sides evenly and more feebly arcuate; apex more feebly and arcuately emarginate; disk broadly convex, finely, densely reticulate; finely, evenly and distinctly punctate. Scutellum triangular, apex not rounded, three-fourths wider than long. *Elytra* at base fully as wide as the prothorax; sides convergent, evenly and not strongly arcuate to the apex, which, conjointly is obtusely and evenly rounded, not at all truncate; inner angles very narrowly rounded; disk nearly two and one-half times as long as the prothorax, moderately convex, more finely and densely reticulate than the pronotum, not perceptibly punctate. Eighth segment with a long anal style and two short spinules on each side. Length 1.6 mm.

California; (Mendocino and Humboldt Cos.). Several specimens.

This species is closely allied to *alutacea*, but differs in its more evenly oval and narrower form, its relatively narrower prothorax, much more shining surface, stronger and more evident pronotal punctuation, shorter, more robust maxillary palpi, and particularly in the form of the scutellum. The two discal punctures of the epistoma are slightly stronger,

and the transverse epistomal suture is less obsolete than in *alutacea*. The sides of the prothorax are very distinctly less strongly arcuate in *congener*.

L. coniciventris n. sp. — Oval, attenuated behind, piceo-testaceous, paler beneath; legs pale brownish-flavate; pubescence extremely fine and sparse; integuments polished. *Head* not one-half wider than long, feebly convex, scarcely perceptibly reticulate, excessively minutely, feebly and not distinctly punctate; epistomal suture almost completely obsolete. *Prothorax* at apex about equal in width to the head, broadly, feebly, arcuately sinuate, fully one-half wider than long; at base broadly truncate, very feebly sinuate on each side of the scutellum, nearly two and one-half times as wide as long; sides evenly and distinctly arcuate; disk broadly convex, polished, scarcely perceptibly reticulate, excessively minutely, feebly punctate; punctures somewhat irregularly disposed, very sparse. Scutellum very small, more than twice as wide as long, triangular. *Elytra* at base scarcely as wide as the prothorax; sides strongly convergent, nearly straight to the apex, which conjointly is abruptly and transversely truncate, one-half as wide as the elytral base; outer angles rounded, inner very narrowly so; disk rather strongly, conically convex, smooth; coarsely, very finely reticulate, not perceptibly punctate; one-third longer than wide, two and one-half times as long as the prothorax. Seventh segment broad, broadly rounded behind; eighth having two equal apical setæ. Posterior femora very strongly compressed. Length 1.0 mm.

Texas; (Austin 1).

The labrum is more continuous in curvature with the epistoma, and is consequently more prominent from above than in the other species; it appears from above to be transversely subtruncate or very broadly rounded, but when viewed in prolongation of the axis of the insect it is seen to have the lower edge rather abruptly deflexed, and broadly, rather feebly sinuate.

The general outline of this species is very different from that prevailing in the genus, but it appears to possess all the generic characters of *Limnocharis*. It is decidedly the smallest species described.

SILPHA Linn.

S. ænescens n. sp. — Form rather depressed, elongate, oval, black; upper surface with a bright æneous lustre; legs and antennæ black throughout; shining; pubescence in the form of an excessively minute and almost invis-

ible short setæ from each puncture. *Head* rather small, constricted behind the eyes; front feebly convex, finely and rather densely punctate, more closely so near the eyes, and much more sparsely and finely so near the apex and on the labrum; the latter very deeply and rather narrowly sinuate at apex; eyes moderate, slightly prominent, much shorter than wide, vertically oval; antennæ slender, as long as the pronotum, first joint as long as the next two together, second much longer than the third, last four joints forming a rather narrow, elongate, perfoliate club, the last three joints of which are rendered opaque by an excessively fine and dense pubescence, eleventh slightly longer than wide, flattened, evenly and broadly rounded at tip. *Prothorax* widest at the base, where it is generally slightly more than one-half wider than long; sides strongly convergent thence to the apex, broadly, evenly and distinctly arcuate; apex broadly and feebly incurvate, one-half as wide as the base; the latter broadly truncate in the middle and thence slightly oblique and very feebly sinuate to the basal angles; the latter slightly obtuse, narrowly rounded; disk broadly and rather feebly convex, more strongly so in the middle anteriorly, narrowly and obsoletely impressed along the middle, and more broadly and obliquely near each basal angle; sides narrowly and gradually subexplanate, narrowly margined with an elevated border; surface finely and very densely punctate; punctures round, deep, sometimes with a few smaller ones intermingled. *Scutellum* very densely punctate; pubescence longer and more dense. *Elytra* at base about as wide as the prothorax; sides parallel and nearly straight, rather abruptly and broadly rounded behind, slightly truncate in the males; disk one-third longer than wide, more than twice as long as the prothorax, transversely and moderately convex, narrowly and abruptly reflexed at the sides; each with three longitudinal, feebly-elevated costæ, with numerous intermediate and subtransverse elevations; depressed areas rather coarsely and not very densely punctate, interspaces finely and strongly granulose. *Legs* moderate in length, slender; first joint of the posterior tarsi fully as long as the fifth, and as long as the next three together. Length 11.0-13.0 mm.

California; (San Francisco).

The sexual characters are as follows:—

Male—Last ventral segment transversely truncate at apex, edge almost perfectly straight; anterior tarsi very feebly dilated, middle not at all dilated, very slender.

Female—Last ventral segment narrowly and strongly rounded behind, immediate apex narrowly truncate or subsinuate; tarsi all narrow and slender.

This species resembles *ramosa* Say, but differs in its

æneous lustre, much coarser elytral sculpture, and in the sexual characters; both the anterior and middle tarsi of the male in *ramosa* are strongly dilated. All the many specimens which I have seen are æneous above, and this appears to be a very persistent character. The form is mentioned by Mannerheim (Bull. Mosc. 1843, No. 2, p. 252) as *Silpha cervaria*, Var. b. It is also mentioned by Dr. Horn (Tr. Am. Ent. Soc. VIII, p. 241) as one of the variations of *S. ramosa* Say.

S. cervaria Mann.—This is apparently a valid species, being represented in my cabinet by two specimens of unmistakably more broadly oval outline than *ramosa*; the dorsal surface also exhibits very decided differences in sculpture.

BATRISUS Aubé.

Although this large and important genus is in a state of comparative confusion, it is believed that the description of the following forms is warrantable, since no species have yet been described from California, and the possibility of increasing our synonymy is, therefore, very slight. It is true that *B. albionicus* Aubé has been ascribed to California, but as the locality is not mentioned by Aubé in either of his descriptions, this would appear to be more or less doubtful; at any rate it is easily distinguishable from any of the species here described.

The following species all belong to the group having trisulcate and bituberculate pronotum, although in one or two forms the median channel becomes almost or quite obsolete; they also agree throughout in having a terminal process at the apex of the posterior tibiæ, and in the similarity of the sexual characters. The latter are well marked, and are as follows:—

Male.—Abdomen more or less deeply impressed near the apex; terminal process of posterior tibiæ short and nearly straight; intermediate trochanters

dentate or prominent externally at apex; tenth antennal joint finely tuberculate, eleventh with a short, erect arcuate process at base, both projecting internally.

Female.—Abdomen, trochanters and antennæ normal; terminal process of posterior tibiæ long, slender and contorted. Body smaller, more slender.

The funicle of the antennæ is remarkably constant in structure throughout the series, but the last four joints differ in shape and relative size.

In this group the head is not materially modified in the male, so that it differs greatly from a large and important group of eastern species. From a direct comparison with *B. formicarius* Aubé, the type of *Batrissus*, it is probable that these species should be separated as a subgenus; this has apparently been already done by Reitter under the name *Batrissodes*.

The type of the European *Batrissus* is found, as its name implies, with ants; the Californian species are never found in such localities, but are to be met with only in wet moss or under stones near water-courses; although widely diffused, they are scarcely ever abundant, and are generally extremely rare.

B. mendocino n. sp.—Moderately robust, convex, dark brownish-rufous; legs same; abdomen and antennæ darker, castaneous, the latter pale toward apex; integuments polished; pubescence coarse, rather long, suberect, rather sparse. *Head* moderate, scarcely as wide as long; eyes rather small, very convex, prominent, at more than their own length from the base; sides behind them strongly convergent and arcuate to the neck, which is slightly less than one-half as wide as the width at the eyes, very feebly sinuate; surface impunctate, slightly convex; on a line through the posterior limits of the eyes there are two distinct, deeply impressed foveæ, apparently nude, connected by a deeply impressed, strongly and evenly arcuate channel; antennal tuberculations broad and prominent; antennæ rather slender, distinctly longer than the head and prothorax together, club slender; basal joint rather robust, scarcely longer than wide, apex deeply notched posteriorly for the reception of the second joint when flexed; joints two to five equal, slightly longer than wide, sixth and seventh equal, slightly smaller, longer than wide, eighth as wide as the seventh, rounded, as wide as long, eighth to eleventh gradually wider, ninth and tenth equal in length, the latter much more strongly transverse, eleventh elongate, conoidal, pointed. *Prothorax* widest at two-fifths the length from the apex, where it is as wide as the head, slightly wider than

long; sides strongly rounded, thence convergent and deeply sinuate to the base which is broadly arcuate, nearly three-fourths as wide as the disk and one-third wider than the apex; the latter transversely truncate; basal angles slightly obtuse, not rounded; disk very feebly and sparsely punctate, broadly, strongly convex, having in the middle near the base a very deep, nude fovea, continued anteriorly to within two-fifths the length of the apex by a narrow, not deeply impressed channel; on each side and slightly in advance of the fovea, a rather large, obtusely pointed tubercle; also near each basal angle a large, deep, irregular, nude fovea, continued anteriorly by a very broadly and feebly impressed arcuate channel, and connected with the median fovea by a narrow, extremely feeble, transverse line. *Elytra* at base equal in width to the base of the pronotum, at apex two and one-third times as wide; sides evenly, rather strongly arcuate; together transversely truncate behind, nearly as long as wide; disk evenly, moderately convex, very minutely, sparsely, feebly punctate; sutural striæ approximate, distinct; discal very broadly impressed, becoming extinct at one-third the length from the base. *Abdomen* as wide as and slightly longer than the elytra, convex, very minutely, sparsely punctate. *Legs* long, slender; femora rather abruptly swollen before the tip. Length 2.1 mm.

California; (Anderson Val., Mendocino Co. 1.)

The male, has near the apex of the abdomen beneath, a large, very deeply-impressed fovea, wider than long, with the anterior edge broadly and roundly sinuate in the middle. There are two small, deeply-impressed foveæ near the basal margin of the pronotum on each side, the outer being at the basal angles as seen from above.

B. zephyrinus n. sp.—Moderately robust, very convex, rufous; elytra brighter; abdomen slightly darker; legs and antennæ darker, rufous; the latter pale at apex; integuments highly polished; pubescence coarse, sparse. *Head* about as wide as long; eyes rather small, prominent; sides behind them strongly convergent and very feebly arcuate to the neck; the latter broadly sinuate, much less than one-half as wide as the width at the eyes; on a line through the middle of the eyes two small, nude, very deeply, longitudinally impressed foveæ, connected by a strongly arcuate groove, the sides of which are parallel in the basal half of its length; antennal tuberculations prominent, coarsely punctate; antennæ long, slender, much longer than the head and prothorax together; basal joint moderately robust, subcylindrical, longer than wide, eleventh joint robust, conoidal, very obliquely pointed. *Prothorax* widest at two-fifths the length from the apex where it is fully as long as wide, as wide as the head; sides strongly arcuate, thence convergent and distinctly sinuate to the base; the latter broadly arcuate, three-fourths as wide as the disk, one-fourth wider than the apex; the latter transversely truncate; disk strongly convex, finely, sparsely, feebly punctate; near the

base a very deep, rounded, nude median fovea, continued anteriorly by a narrow, feebly impressed groove to within one-third the length of the apex; slightly in advance of the fovea, nearly midway between it and each side, a rather acute tubercle; between the latter and the edge a moderate, irregular, deeply impressed fovea, connected with the median by a feebly impressed, anteriorly arcuate line, and each continued anteriorly by an outwardly arcuate, distinct, impressed channel; also at the base near each basal angle, two small, deeply impressed foveæ. *Elytra* very minutely, sparsely punctate, convex; discal stria in the form of a broad impression, becoming extinct at one-third the length from the base; humeri longitudinally slightly prominent; each elytron with three foveæ at base. Abdomen very finely, sparsely punctate; basal segment with two short, approximate, parallel carinæ at base. *Legs* long, slender. Length 2.2 mm.

Nevada; (Reno, Washoe Co., 1).

This species is closely allied to *mendocino*, and agrees with it in the form of the elytra, abdomen and legs, and nearly so in the antennæ; it, however, differs in the form of the head and prothorax, the lateral channels of the latter being more broadly arcuate in the present species. The basal segment of the abdomen in *mendocino* has two very short rudimentary carinæ not one-half as long as in *zephyrinus*, and the sexual characters differ; in the present species the abdomen has on the under surface, near the apex, a large deeply impressed fovea, as wide as long, which is emarginate anteriorly, the notch being in the form of a very broad cusp.

B. speculum n. sp. — Rather slender, convex, very dark rufo-piceous; legs and antennæ paler, dark rufous, the latter paler at apex; abdomen piceous-black; integuments highly polished; pubescence rather coarse, suberect, sparse. *Head* slightly longer than wide; eyes small; sides strongly convergent, distinctly arcuate to the neck; the latter much less than one-half as wide as the width at the eyes; surface feebly convex, impunctate; antennal tuberculations not punctate; antennæ long, slender, longer than the head and prothorax together; eighth joint slightly longer than wide, ninth and tenth equal in length, rounded, the former nearly as long as wide, the latter very slightly wider than long, eleventh wider than the tenth, not as long as the three preceding together, conoidal at base, very obliquely pointed. *Prothorax* widest at slightly more than one-third the length from the apex, where it is as wide as the head, very slightly longer than wide; sides feebly sinuate posteriorly to the base, which is three-fourths as wide

as the disk and one-fourth wider than the apex; disk strongly convex, scarcely punctate; basal fovea large, deeply impressed, rounded; median channel very feeble, evanescent near the fovea, extending scarcely beyond the middle of the disk; lateral foveæ moderate in size, not very deeply impressed, extended anteriorly in the usual arcuate groove, and connected with the median by a fine line; immediately behind the middle of the latter, acutely, feebly elevated or subtuberculate; between the median fovea and base a fine elevated carina; on each side, at the base, two small, deeply impressed foveæ. *Elytra* and abdomen nearly as in the preceding species; the former finely and sparsely punctate, the first visible dorsal segment of the latter with two small, short basal carinæ. *Legs* slender. Length 1.9 mm.

California; (Alameda Co. 1).

This species agrees in general structure of the head and prothorax with the preceding species, but may be distinguished from both by its much darker color and structure of the antennal club; from *mendocino* it differs in its much more elongate prothorax and longer basal carinæ of the first abdominal segment; from *zephyrinus* in its shorter basal abdominal carinæ and smaller size, and from both in the much more feeble median channel of the pronotum. The basal carina of the pronotum is common to all these species.

The above description is taken, unfortunately, from the female, but the species is so distinct that there can be very little doubt of its future identification, its small size, slender form, dark color, narrow ninth and tenth antennal joints and especially the very feeble median channel being its distinctive characters.

B. monticola n. sp.—Rather robust, convex, intense black throughout; legs very dark rufo-piceous; antennæ fuscous, very slightly paler, rufous at apex; integuments polished; pubescence coarse, pale, suberect, not very dense. *Head* moderate, scarcely as wide as long; eyes moderate in size, very convex, rather finely granulate, just behind the middle; sides behind them very strongly convergent and feebly arcuate to the neck; surface feebly convex, impunctate; occipital foveæ longitudinally elongate, deeply impressed, on a line through the posterior portion of the eyes, connected by a very strongly arcuate impressed groove; antennal tuberculations large, very coarsely and feebly punctate; antennæ robust, scarcely longer than the head and prothorax together, club rather robust; ninth joint slightly wider than

long, tenth scarcely as long as the ninth, strongly transverse, obliquely truncate throughout its width at apex, eleventh as long as the three preceding together, very slightly wider than the tenth, ovoidal at base, much more convex exteriorly than within, obliquely attenuate and obtusely pointed. *Prothorax* widest at two-fifths its length from the apex, where it is fully as long as wide, as wide as the head; sides very strongly rounded, thence convergent and rather strongly incurvate to the base which is transversely, very feebly arcuate, but slightly more than two-thirds as wide as the disk, one-third wider than the apex; disk strongly convex, very finely, feebly and sparsely punctate; median fovea rather large, rounded, very deep; lateral smaller, continued anteriorly by parallel, arcuate, broadly impressed grooves, connected with the median by anteriorly arcuate and scarcely visible grooves just before the basal tuberculations, which are but slightly elevated, more abrupt anteriorly than posteriorly; lateral basal foveæ rather distant from the basal margin; median carina strong. *Elytra* at base very slightly wider than the base of the pronotum, nearly as long as wide, strongly, evenly convex; very minutely, feebly and sparsely punctate; sutural striæ fine, deeply impressed; discal broadly impressed, short, feeble. Abdomen shorter and very slightly narrower than the elytra, convex, extremely minutely, sparsely punctate; first segment with two short, approximate, parallel carinæ at base. *Legs* long, somewhat robust; posterior tibiæ distinctly bent; tarsi much paler in color. Length 2.2 mm.

California; (El Dorado Co., 1).

The male has at the apex of the venter, a large, very abrupt, deeply impressed fovea, slightly wider than deep, the anterior edge of which is almost entire and transversely truncate.

This species can easily be distinguished from any other here noted by its intense blackness, shorter antennæ, absence of median pronotal groove, and form of the sexual fovea.

The species thus far described have two basal carinæ on the first visible dorsal segment of the abdomen; the following has no basal carinæ, and the elytra are much shorter.

B. occiduus n. sp.—Rather slender, strongly convex; body very uniform in color throughout, dark brownish-rufous; legs slightly paler, rufous; antennæ fuscous, very slightly paler at tip; integuments very highly polished; pubescence coarse, pale, very sparse. *Head* moderate, as wide as long; eyes small, prominent; sides behind them very strongly convergent, strongly arcuate to the neck, which is transversely truncate, two-fifths as wide as the

width at the eyes; surface broadly convex, impunctate; occipital foveæ rather large, very deep, but slightly elongate, joined by the usual strongly arcuate, impressed groove; antennal tuberculations rather prominent, with a few small, widely scattered punctures; antennæ slender, slightly longer than the head and prothorax together, club rather strong, rapidly increasing in width from the ninth joint which is slightly wider than long, tenth strongly transverse, much wider than the ninth, slightly obliquely truncate at the apex, eleventh twice as wide as the ninth, truncate at base, ovoidal, obliquely acuminate, rather acutely pointed, as long as the three preceding together. *Prothorax* nearly as in *monticola*; sides less acutely rounded before the middle, slightly less strongly narrowed toward base; apex slightly broader; basal tubercles more symmetrically pointed and more prominent; median groove narrow, rather deeply impressed, continuing from the basal fovea nearly to the apical margin. *Elytra* at base as wide as the base of the pronotum, at apex more than twice as wide; sides evenly, very strongly arcuate; disk strongly convex, distinctly wider than long, rather coarsely, very sparsely and feebly punctate; sutural striæ deeply impressed, nearly straight; discal very short, very broadly and roundly impressed, gradually evanescent at a little more than one-third the length from the base. *Abdomen* as wide as and much longer than the elytra, convex; first visible segment with three large equidistant, densely-pubescent foveæ along the basal margin; carinæ completely obsolete. *Legs* rather long, very slender; femora rather abruptly, strongly swollen beyond the middle; posterior tibiæ scarcely perceptibly bent. Length 1.9-2.1 mm.

California; (Humboldt Co. 4).

Described from the male, in which the apical fovea is large, slightly wider than long and rather feebly impressed; the anterior edge is truncate and very broadly, feebly sinuate toward the middle. In the female the elytra are slightly shorter.

Easily recognizable by the very long, well marked, median pronotal sulcation, by the short elytra, and absence of basal carinæ.

BRYAXIS.

This genus, in the broad sense indicated by LeConte, (Tr. Am. Ent. Soc. VIII. p. 181), contains a rather heterogeneous assemblage of species, although the various groups are clearly indicated. It will be noticed that there are two classes of foveæ upon which the subdivisions are based—

those of the head and pronotum respectively, the former being made to serve in subdividing the genus *Reichenbachia*. It will be well to consider these sets of foveæ in order.

During a recent collecting tour in Texas, I secured a large series of a uniformly flavo-ferruginous species of *Reichenbachia*, belonging to the group in which the male and female antennæ are different in structure. These specimens were all taken in a very limited area, and are without the least doubt of a single species. The males have the fifth and sixth joints of the antennæ elongate and swollen; upon the occipital portion of the head there are two small, widely distant, spongiose foveæ, but the apical fovea is completely wanting. The females also have the same joints of the antennæ elongate and slightly dilated; the head has the occipital foveæ exactly similar in size and position to those of the male, and in addition a third apical fovea, similar to the others and equally pronounced. The male above noted was described by Dr. LeConte as *tumida*; whether the female has been described as a trifoveate species is a question requiring further investigation.

It is seen, therefore, that the presence or absence of the apical fovea may sometimes be a sexual character, at least in a certain class of species of which one is *R. tumida*, and it is consequently of very little moment in a generic classification, although the occipital foveæ appear to hold a very different position, and are evidently of more distinct value.

The pronotal foveæ are very important from a generic point of view, since they indicate great and radical differences, which extend throughout the body, and are evinced by peculiar manifestations of sexual identity. For instance, restricting ourselves for the present simply to the American fauna,—those species having three small, equal, punctiform foveæ, are the only ones which are subject to a very decided sexual modification of the antennal club. Those having three large, subequal, spongiose foveæ are,

amongst those having occipital foveæ, the only ones exhibiting sexual modification of the dorsal surface of the abdomen; while those which have two large spongiöse lateral foveæ and a minute nude median puncture are the only ones which possess a sexual modification of the middle joints of the antennæ, although there are many species which have the antennæ similar, as there are several in the preceding section which have the abdomen similar, in the two sexes.

Again, those having three nude pronotal foveæ which are unequal, are distinguished by a complete absence of occipital foveæ, and, considering the sexual modifications apparent in other portions of the group accompanying such decided differences in the foveæ, we might be led to expect a peculiarity here also.

From Galveston, Texas, I have before me two species of this section. One of these is represented by seven males and three females, the other by three males only, the latter having an almost impunctate head and longer elytral striæ; these have the first segment elongate, and the middle portion of the dorsal surface behind its apex exhibits sexual modifications consisting of excavations and minute tuberculations of the greatest complexity. The males of the first species have shorter elytral striæ, a more punctate head, and also exhibit sexual characteristics affecting the dorsal surface of the abdomen, although of an entirely different kind. The first two segments are perfectly normal, the first slightly elongate, but the third is very broadly and feebly impressed, the impression having in the middle a tuft of long erect sparsely-placed setæ. The sexual characters, therefore, affect the same part of the body as in *Bryaxis*, but instead of being limited mainly to the first segment, it is the portion posterior to this which is principally modified. These species are, however, well distinguished from *Bryaxis* by the presence of lateral carinæ on the lower surface of the head.

In at least certain groups of Coleoptera, sexual characters should be considered generic when they are evinced by such radically different modifications, for these imply decided differences in the methods of exercising the functions pertaining to reproduction, the most important act in the lives of these organisms, and are the outward signs of innate differences much greater than those made apparent by mere external form. From a biological standpoint they are the most important characters which can be assumed, and in the present instance have an unquestionable value.

I have, therefore, drawn up the following scheme of genera, the differences being indicated by characters which are non-sexual, and which readily serve for identification irrespective of the more important differences which have been indicated above.

Head having two occipital foveæ, not carinate laterally beneath.

Pronotal foveæ joined by an impressed line.....**Rybaxis.**

Pronotal foveæ three in number, generally not connected.

Foveæ subequal, large, all spongiose.....**Bryaxis.**

Foveæ equal, smaller, punctiform.....**Nisa.**

Foveæ unequal and dissimilar.

Lateral large, spongiose; median small, nude...**Reichenbachia.**

Head having no occipital foveæ, finely and strongly carinate beneath laterally.

Pronotum having small, feebly-impressed, lateral foveæ and a very minute, more abrupt median puncture, all nude.....**Nisaxis.**

Pronotum devoid of foveæ; elytral striae obsolete¹.....²

RYBAXIS Sauley.—In our fauna this genus contains the three species *sanguinea* Leach, *conjuncta* Lec. and *Brendelii* Horn.

NISA n. gen.—There being no specimen of this genus before me at the present time, I cannot state positively whether the head is laterally carinate or not, it is, how-

¹ LeConte—Tr. Am. Ent. Soc. VIII, p. 183.

² The characters given for *inornata* Brend. indicate a very peculiar species which warrants closer study than has yet been given it. As the occipital foveæ are wanting, it may be attached for the present to *Nisaxis*, but it probably possesses differential characters of generic value.

ever, attached to that group to which it is probably most closely allied. *Nisa* includes but two species, *luniger* Lec. and *cavicornis* Brend.

REICHENBACHIA Leach.—By direct comparison with European representatives there is no apparent difference in the American forms.

NISAXIS n. gen.—Here the species are decidedly more minute than in any of the other genera of this group, and are probably more abundant than hitherto supposed. It is very distinct in its cephalic characters, as well as those of the pronotum and sexual modifications. The discal striæ of the elytra are usually shorter than in the other genera, and the basal carinæ of the first dorsal segment short and widely distant. At present it can include only *tomentosa* Aubé.³

BRYAXIS Leach.

The more salient characters separating *Bryaxis* from the other genera here noted, besides the sexual modifications already mentioned, are the comparatively large size, more distinct abdominal border, the pronotal foveæ and the very large eyes situated almost at the extreme base of the head.

B. texana n. sp.—Form rather slender, pale rufo-testaceous throughout; legs concolorous; antennæ and abdomen very slightly darker; integuments polished; pubescence very short, suberect, not dense. *Head* rather small; eyes very large, prominent, situated very close to the basal angles, more convex posteriorly; base broadly truncate; surface feebly convex, impunctate, occipital foveæ situated on a line through the anterior portion of the eyes, moderate, rather deeply impressed, mutually more than three times as distant as either from the eye; apical fovea very slightly smaller, more broadly impressed at the sides; apical angles very slightly rounded; antennæ rather slender, distinctly longer than the head and prothorax together, club rather

³The species described by me (Cont. I, p. 33) as *inopia*, has been considered a synonym of this species in the recently published Check List of North American Coleoptera. As *inopia* has two well-developed occipital foveæ, it cannot be placed in the neighborhood of *tomentosa*. If the compilers of the catalogue are determined to regard it as a synonym, some more appropriate species should be selected with which to combine it; it belongs near *rubicunda*, although somewhat resembling *tomentosa*.

prominent; joints three to eight equal in width, nine to eleven increasing uniformly and rather rapidly in width. *Prothorax* widest in the middle, where it is scarcely wider than the head, distinctly wider than long; sides very narrowly rounded, convergent and more broadly rounded anteriorly, moderately convergent and rather deeply sinuate toward base; the latter broadly, feebly arcuate, five-sixths as wide as the disk, one-half wider than the apex; the latter transversely truncate; disk strongly convex, not perceptibly punctate, broadly impressed before the base toward the sides, transversely subgranulose along the base; lateral foveæ rather large, deeply impressed, at one-third the length from the base; median about equal in size, less deeply impressed. *Elytra* at base distinctly wider than the prothorax, at apex twice as wide as the latter; sides evenly and moderately arcuate; disk distinctly wider than long, broadly and not strongly convex, more abruptly declivous along the sides; humeri rather prominent; surface excessively feebly and obsoletely punctate; sutural striæ fine, deeply impressed, nearly parallel; discal very fine and feeble, slightly arcuate, gradually evanescent at slightly less than one-third the length from the apex. Abdomen polished, impunctate; border strong; carinæ of first segment very short, divergent, distant by fully two-fifths the total width. *Legs* rather long and slender; posterior tibiæ feebly clavate, very slightly bent, very feebly and obsoletely grooved exteriorly at apex. Length 1.3 mm.

Texas; (El Paso 1).

The sole representative is a male, exhibiting the usual very marked abdominal characters. The first segment is very long, four-fifths as long as the elytra, and is almost the only portion of the abdomen seen when viewed vertically; its apex is rather abruptly deflexed, transversely impressed in the middle; the edge with a small, rounded, very distinct, median sinuation; remaining segments almost vertical, very short, almost equal; second broadly and extremely feebly sinuate in the middle; surface anteriorly with a transversely arcuate, impressed channel which is partially hidden under the first segment, and which corresponds in outline with the sinuation of the first; remaining segments not sensibly modified. The apical margins of the first and second segments are abruptly thinner.

This species probably belongs to the *Belfragei* type, but the description of that species will not apply to this.

B. infinita n. sp.—Form slightly robust, dark rufo-castaneous; head blackish; elytra rufous, darker at base and apex; antennæ and legs concolorous,

dark fuscous; integuments polished; pubescence rather coarse, very short and rather dense. *Head* moderate, much wider than long; eyes very large, prominent; base broadly truncate; surface feebly convex, scarcely perceptibly punctate; occipital foveæ rather large, feebly impressed, on a line through the anterior margins of the eyes, mutually two and one-half times as distant as either from the eye; apical equal in size, feebly impressed; surface between the antennæ gradually declivous; antennæ somewhat robust, distinctly longer than the head and prothorax together, club rather prominent; basal joint feebly dilated, slightly longer than wide, second slightly smaller, longer than wide, subcylindrical, third slightly shorter, slightly obconical, distinctly longer than wide, tenth as long as wide, much wider than the ninth, eleventh distinctly wider than the tenth, slightly elongate, obliquely acuminate. *Prothorax* widest at two-fifths the length from the apex, where it is scarcely wider than the head, nearly one-third wider than long; sides rather strongly rounded, rather strongly convergent and feebly sinuate to the base; the latter broadly, feebly arcuate, three-fourths as wide as the disk, one-half wider than the apex; the latter transversely truncate; disk strongly convex, scarcely punctate; lateral and medial foveæ equal, moderate, the former more broadly impressed. *Elytra* at base distinctly wider than the prothorax, at apex slightly less than twice as wide as the latter; sides evenly, not very strongly arcuate; disk slightly wider than long, evenly, rather feebly convex, extremely minutely punctate; sutural striæ very distinct and deeply impressed, rather approximate, nearly parallel; discal deeply impressed and distinct, becoming slightly recurved posteriorly, and terminating abruptly at one-fifth the length from the apex. *Abdomen* fully as wide as the elytra; border wide and prominent; surface scarcely punctate, moderately convex; basal carinæ distant by slightly more than one-third the total width, distinct, less than one-third as long as the segment, almost parallel. *Legs* rather long and slender. Length 1.5 mm.

Texas; (Austin 14).

This species is remarkable amongst the American representatives of the genus, in the complete absence of male sexual modifications of the dorsal segments of the abdomen. The male described above is very slightly more robust than the female, and has the antennæ slightly longer and with a more prominent club, the tenth joint especially being shorter and more transverse in the female. The type specimen has the cœdeagus protruded. The lateral members are seen to be two thin, elongate laminae, obliquely acuminate at apex and having at the middle of the external edge a small tuft of dilated membranous hair.

REICHENBACHIA Leach.

The species are numerous, as a rule smaller than in the preceding genus, and especially distinguished by the rather finer abdominal border and the dorsal surface similar in both sexes. The species here described may be assigned as follows:—

Head ♂ and ♀ with three foveæ.

Antennæ dissimilar in the two sexes.

tumorosa, *tumidicornis* and *informis*.

Antennæ similar in the sexes *gracilicornis* and *nevadensis*.

Head ♂ and ♀ bifoveate.

Antennæ dissimilar in the sexes *fundata* and *franciscana*.

The special relationships will be indicated under each description.⁴

R. tumorosa n. sp.—Rather robust; color rather dark rufo-castaneous; antennæ concolorous in the middle, paler at base and toward the apex; elytra and legs paler, much more flavate, the former not darker at apex; pubescence fine, short, not at all dense. *Head* rather small; eyes moderate, prominent, very coarsely granulate, at nearly their own length from the base; front transversely and rather strongly convex, almost completely impunctate, highly polished, having on a line through the middle of the eyes, two small, deeply impressed foveæ, mutually three and one-half times as distant as either from the eye; with a large, deep impression between the antennæ at the bottom of which there is a very minute, spongy-pubescent fovea; apex strongly declivous, angularly and slightly produced in the middle; antennæ rather short, robust, as long as the head and prothorax together; first joint moderate, second smaller, subglobular, third wider, short, strongly transverse, triangular, closely adjacent to the fourth, which is very large, strongly transverse; joints five to eight, transverse, very rapidly and uniformly diminishing in width, sixth shorter than the seventh, eighth normal, eight to eleven evenly, very gradually increasing in width. *Prothorax* moderate in

⁴The long, erect, stout setæ, growing upon the lower surface of the head are sometimes bulbous at the extremity, the enlargement being apparently formed of a viscid substance which may perhaps be a secretion. If, however, this is the case, the setæ are in all probability hollow tubes. It may be this secretive matter which is so pleasing to ants, with which so many species of *Pselaphidæ* are associated. The same appearance of the setæ has been before referred to in a short paper on our *Euplectini* (Cont. II, p. 94), although at that time I had not remarked the viscid nature of the material forming the enlargement.

size, widest at two-fifths its length from the apex, where it is slightly wider than the head and distinctly wider than long; sides strongly, evenly rounded, moderately convergent and feebly sinuate toward base; the latter broadly, very feebly arcuate, one-half wider than the apex, which is transversely truncate, and four-fifths as wide as the pronotal disk; basal angles obtuse and very slightly prominent, not at all rounded; disk strongly, evenly convex, polished, almost impunctate, lateral foveæ rather small, not very deeply impressed; median puncture very small; base finely margined, surface immediately before it feebly impressed, the impression obsolete in the middle. *Elytra* at base distinctly wider than the prothorax, at apex fully twice as wide as the latter; sides evenly, rather strongly arcuate; together broadly truncate behind; disk evenly, rather strongly convex, much wider than long, two-thirds longer than the pronotum, finely, very feebly and obsoletely, evenly and rather sparsely punctate; sutural striæ strong; discal strong, feebly arcuate, abruptly terminating at one-fifth the length from the apex. *Abdomen* impunctate, highly polished, rather convex; first segment longer than the next two together, with two fine, very distinct carinæ, which are distant by two-fifths the entire width, nearly one-half as long as the segment, and nearly parallel; at each side, near the border, and partially under the elytra, there is a large spongiöse fovea; between this and the border a fine attenuated carina, two-thirds as long as the segment. *Legs* long and slender. Length 1.4 mm.

California; (Sonoma Co. 4).

The description is taken from the male; the female antennæ are normal, robust and scarcely as long as those of the male. In the latter the terminal segment of the dorsal surface is very broadly emarginate at apex, the emargination being evenly rounded and nearly ten times as wide as deep; the ventral segments are not at all impressed.

This species belongs near *sagax* Lec., but differs greatly in the structure of the male antennæ as recorded in the original description of that species.

R. tumidicornis n. sp.—Form rather slender, piceous; antennæ slightly paler at apex; elytra bright rufous, base and apex clouded with a darker tint, legs dark rufous; pubescence rather coarse, very short, not dense; integuments polished. *Head* moderate in size; eyes rather small, very convex, coarsely granulated and prominent, at fully their own length from the base; sides behind them feebly convergent, distinctly arcuate; base broadly truncate; angles narrowly rounded, not prominent; surface broadly, feebly convex, excessively minutely, sparsely punctate; on a line through the middle of the eyes there are two large, deeply impressed foveæ, mutually three times as distant as either from the eye; also near the apex a slightly smaller fovea, with the

sides more broadly impressed; apex broadly angulate; antennæ as long as the head and prothorax together; basal joint rather small, longer than wide; second slightly smaller, cylindrical, slightly longer than wide; third small, scarcely as long as wide, obconical; fourth as wide as the second, very strongly transverse; fifth strongly inflated, transversely oval, more than twice as wide as long; sixth slightly more strongly dilated; longer, transversely ovoidal, slightly more acute inwardly; seventh widest, shorter than the preceding, apex truncate, very strongly transverse, more acute inwardly, more than three times as wide as long; eighth slightly longer than the seventh, one-half wider than long, obliquely truncate inwardly; ninth very small, slightly wider than long; tenth slightly wider than long, distinctly wider than the ninth; eleventh rather slender, pointed, as long as the three preceding together, distinctly wider than the tenth. *Prothorax* widest very slightly in advance of the middle, where it is slightly wider than long, very slightly wider than the head; sides strongly arcuate, feebly sinuate before the basal angles; disk strongly convex, very minutely punctate; lateral foveæ very large, rather deep; surface near the base slightly impressed and coarsely punctate toward the sides; median puncture elongated longitudinally. *Elytra* at base much wider than the prothorax, at apex more than twice as wide as the [latter; sides strongly and evenly arcuate; truncate behind; disk rather strongly and evenly convex, excessively minutely, rather sparsely punctate, one-fourth wider than long, two-thirds longer than the prothorax; sutural striæ strong, nearly straight; discal very fine, rather feeble, terminating at one-fifth the length from the apex. First ventral segment much shorter than the next two together; carinæ very fine, two-fifths as long as the segment, distinctly divergent, distant by one-third the total width; carinæ near the lateral border nearly as long as the entire segment; lateral basal foveæ distinct. *Legs* rather long, very slender; posterior tibiæ very slender, distinctly arcuate and clavate, scarcely at all flattened. Length 1.2 mm.

California; (Santa Cruz and Santa Clara Cos.)

Described from the male in which the terminal dorsal segment is narrowly and very feebly emarginate at apex, the emargination much narrower than in *tumorosa*, evenly rounded, about eight times as wide as deep; ventral segments not impressed. In the female the antennæ are slightly shorter than in the male, normal, club robust.

Very abundant throughout the region indicated. It belongs near *albionica* (Mots.), but differs according to the description given by Dr. LeConte in the structure of the male antennæ, and more especially in that of the posterior tibiæ which are not perceptibly flattened. The antennæ

of *albionica* are described as having the "fifth joint dilated, sixth larger than the following, rounded, 7—9, large, transverse." This description evidently cannot be applied to *tumidicornis*. One of the localities given by the above-mentioned authority is Colorado; this is probably a misprint for California, as there is very little likelihood of *albionica* occurring east of the Sierra Nevada Mts.

In the description of *albionica* given by Mannerheim (Bull. Mosc. 1852, p. 371), the only joints which are described as dilated are the fifth and sixth. In the present species the seventh is distinctly the widest. The posterior tibiæ are not described by Mannerheim as being flattened, but simply dilated, which is more nearly the case in *tumidicornis*. There have probably been several species confounded by the various authors, as these species do not appear to have a very wide distribution, but are more or less local.

Although so abundant about Santa Cruz, I have not yet found this species to the north of San Francisco, although I have collected over very extensive regions, giving special attention to the Staphylinidæ and Pselaphidæ. Its gait is rather more rapid than is usual in this genus.

R. informis n. sp.—Rather slender, dark rufo-castaneous; elytra bright rufous, slightly darker near the apex; antennæ and legs pale rufo-testaceous; integuments polished; pubescence very fine, short and sparse. *Head* moderate; eyes very convex, at scarcely their own length from the base; sides behind them feebly convergent and arcuate; base broadly truncate; angles distinctly rounded; surface feebly, evenly convex, excessively minutely, sparsely punctate; punctures slightly larger and closer toward the sides; having, on a line through the middle of the eyes, two moderate, not very deeply impressed foveæ, mutually three times as distant as either from the eye; near the apex a more broadly impressed fovea, with the pubescent portion equal to that of the occipital foveæ; apex declivous, broadly angulate; antennæ as long as the head and prothorax together, club robust; basal joints moderate, second slightly the smaller; third slender, much longer than wide; fourth small, slightly transverse; fifth slightly dilated, a little longer than wide; sixth as long as wide, as wide as the fifth, obliquely truncate at apex, joints seven to nine, very slightly wider than long, equal in width to the fifth; the eighth slightly smaller; nine to eleven very rapidly increasing in width. *Prothorax* widest very slightly before the middle, where it is very slightly

wider than the head and slightly wider than long; sides rather strongly, evenly rounded, moderately convergent to the base, very feebly sinuate near the basal angles, which are obtuse, not rounded; base broadly, feebly, but distinctly arcuate, one-half wider than the apex; the latter transversely truncate; disk strongly convex, excessively, minutely, sparsely punctate, coarsely so along the basal margin; lateral foveæ rather small, not very deeply impressed, at less than one-third the length from the base; median very small, longitudinally, slightly elongate. *Elytra* at base distinctly wider than the prothorax, at apex more than twice as wide as the latter; sides evenly, not very strongly arcuate; apex truncate, feebly sinuate laterally; disk very slightly wider than long, nearly three-fourths longer than the prothorax, evenly, moderately convex, excessively minutely, obsoletely and sparsely punctate; sutural striæ deeply impressed, nearly straight; discal fine, distinct, slightly arcuate, terminating at one-tenth the length from the apex. *Abdomen* rather elongate, convex; first segment not as long as the next two together; basal carinae distinctly divergent, separated by distinctly less than one-third the total width, one-half as long as the segment. *Legs* rather long and slender; hind tibiae not strongly clavate. Length 1.4 mm.

California; (Mendocino Co., 2).

Described from the male; the terminal dorsal segment is more than four times as wide as long, very broadly, feebly emarginate at apex.

This species belongs near *propinqua* Lec., but is not very closely related to any other described species.

R. gracilicornis n. sp.—Rather robust, dark rufo-castaneous; elytra dark, obscure rufous; antennæ and legs paler, dark rufo-testaceous; integuments rather dull, head and elytra more polished; pubescence coarse, rather long, moderately dense, suberect, rather conspicuous. *Head* moderate or rather small, much longer than wide; eyes rather large, very convex, at much less than their own length from the base; sides behind them strongly coarctate to the base which is broadly subsinuate; surface feebly, evenly convex, not perceptibly punctate; having on a line through the middle of the eyes two rather large and feebly impressed foveæ, mutually more than three times as distant as either from the eye; apical fovea slightly smaller but more widely and deeply impressed; antennal emarginations rather approximate, angular; apex slightly produced, narrow, declivous, with the sides nearly straight and feebly divergent anteriorly; antennæ very slender, slightly longer than the head and pronotum together; first and second joints longer than wide, cylindrical, the second slightly smaller, three to six each cylindrical, slender, more than twice as long as wide, sixth slightly smaller, seven and eight scarcely more robust, the former twice as long as wide, the latter quadrate, ninth slightly more robust, a little longer than wide, tenth slightly wider than long, two-thirds wider than the ninth, slightly trapezoidal, elev-

enth one-half wider than the tenth, obliquely ovoidal, pointed. *Prothorax* widest at two-fifths the length from the apex, where it is much wider than the head and one-third wider than long; sides acutely rounded, slightly convergent and feebly arcuate to the base, before which they are nearly straight; base broadly, feebly arcuate, one-half wider than the apex and three-fourths as wide as the disk; apex broadly, very feebly emarginate; disk strongly convex, very minutely punctate; lateral foveæ large, feebly impressed, at two-fifths the length from the base; median small, well before the base. *Elytra* at base just visibly wider than the prothorax, at apex slightly less than twice as wide as the latter, broadly truncate, feebly trisinuate; sides evenly, not strongly arcuate; disk broadly convex, finely, not densely, very feebly punctate; sutural striæ deep, feebly arcuate; discal fine, distinct, not deeply impressed, terminating at one-tenth the length from the apex. Abdomen rather short, moderately convex; first segment distinctly longer than the next two together; carinæ fine, distinct, nearly one-half as long as the segment, feebly divergent, feebly directed outward at apex, distant by less than one-fourth the total width; carinæ adjoining the margins extremely fine, almost obsolete. *Legs* long and slender; posterior tibiæ feebly clavate, slightly bent inward toward the apex, where there is externally a short groove for the reception of the tarsi when reflexed. Length 1.3 mm.

Texas; (Austin 1).

Described from the male; the terminal dorsal segment has at the apex a small semicircularly rounded emargination, nearly twice as wide as deep, the angles being acute and slightly produced; last ventral segment very feebly impressed in the middle.

This species belongs to the *rubicunda* type of the genus and should be placed near that species, from which it differs in the smaller and deeper apical emargination of the male.

The external groove at the apex of the posterior tibiæ appears to be a generic character.

R. nevadensis n. sp.—Moderately slender, piceous; elytra rufous, slightly darker at apex; legs dark, brownish-piceous; antennæ slightly paler, rufous; integuments polished; pubescence short, coarse, evenly but not densely placed. *Head* moderate; eyes rather large, prominent, at scarcely more than one-half their own length from the base; sides behind them rather strongly convergent and strongly arcuate to the base, which is very broadly truncate; surface rather strongly convex, not perceptibly punctate behind; having on a line just in advance of the middle of the eyes two large, deeply impressed foveæ, which are mutually two and one-half times as distant as either from the eye; between the antennæ transversely impressed,

impression finely punctate, having at the bottom a smaller circular fovea; antennæ short and robust, not as long as the head and prothorax together, club robust, second joint subcylindrical, longer than wide, slightly narrower than the first, three to eight narrower, subequal in width, third, fifth and sixth slightly longer than wide, fourth and seventh subquadrate, eighth smallest, wider than long, eight to eleven increasing evenly and very rapidly in width, ninth and tenth strongly transverse, eleventh slightly longer than wide, obtusely and obliquely acuminate. *Prothorax* widest at one-third the length from the apex, where it is very slightly wider than the head and one-fifth wider than long; sides rather strongly, narrowly rounded, moderately convergent and nearly straight toward base, just before which they are very feebly sinuate; base three-fourths as wide as the disk, one-third wider than the apex; the latter transversely truncate; disk strongly convex, scarcely perceptibly, sparsely punctate; lateral foveæ moderate, at two-fifths the length from the base; median small, distinct, not at all elongate. *Elytra* at base distinctly wider than the prothorax, at apex distinctly more than twice as wide as the latter; sides evenly, rather strongly arcuate; disk moderately convex, scarcely perceptibly punctate; sutural striæ deeply impressed, nearly parallel; discal rather strongly arcuate and deeply impressed, terminating at one-fifth the length from the apex; together distinctly wider than long, two-thirds longer than the prothorax. *Abdomen* moderately convex; basal segment as long as the next two together; carinæ distant by two-fifths the entire width, very short, distinctly less than one-third as long as the segment, distinctly divergent, nearly straight. *Legs* slender, posterior tibiæ feebly clavate, strongly arcuate. Length 1.3 mm.

Nevada; (Reno, Washoe Co. 3).

The sexual characters appear to be very slight, but there is apparently very little doubt that it belongs in the *rubicunda* group of species. It may be readily distinguished by the transverse impression between the antennæ and the very short basal carinæ of the first dorsal segment; in the type these are scarcely more than one-sixth or one-eighth as long as the segment, but in another specimen which has shorter antennæ, and therefore probably the female, they are more than one-fourth as long as the segment. The posterior tibiæ are unusually strongly arcuate.

R. fundata n. sp.—Moderately robust, piceous-black; elytra rufous, clouded slightly darker at apex and base; antennæ dark brownish-piceous; legs dark brownish-piceous, femora more rufous; integuments polished; pubescence fine, very short, somewhat dense on the abdomen. *Head* moderate, wider than long; eyes moderate, at less than their own length from the base;

sides strongly rounded to the base, which is transversely truncate; surface broadly, feebly convex, scarcely perceptibly, sparsely and very obsoletely punctate; occipital foveæ on a line through the anterior portions of the eyes, moderate in size, not very deeply impressed, mutually three times as distant as either from the eye; apical fovea entirely wanting; apex abruptly and very strongly declivous, having two small approximate ciliate tubercles; antennæ long and slender, one-half as long as the body, club slender; basal joint large, irregular, second much smaller, slightly more robust than the third, the latter distinctly longer than wide, fourth smaller, subquadrate, fifth to seventh slightly dilated, the sixth slightly the shortest, as wide as long, eighth narrow, joints eight to eleven very gradually, evenly increasing in width, all longer than wide. *Prothorax* widest at two-fifths the length from the apex, where it is as wide as the head, distinctly wider than long; sides evenly, strongly arcuate, moderately convergent and feebly sinuate to the base; the latter broadly, feebly arcuate, four-fifths as wide as the disk, nearly one-half wider than the apex; the latter transversely truncate; disk strongly convex, not visibly punctate except along the base; lateral foveæ rather small, not very deeply impressed, at one-third the length from the base; median rather large, somewhat longitudinally elongated. *Elytra* at base slightly wider than the prothorax, at apex twice as wide as the latter; sides evenly and rather strongly arcuate; disk evenly, rather strongly convex, sparsely and very obsoletely punctate; sutural striæ deep, nearly parallel; discal distinct, arcuate terminating at one-fifth the length from the apex. *Abdomen* moderately convex; first segment scarcely as long as the next two together; basal carinæ fine, slightly divergent, distant by slightly more than one-third the total width, very short, about one-fourth as long as the segment. *Legs* slender; posterior tibiæ very feebly clavate, slightly bent; tarsi rather long. Length 1.2 mm.

California; (Sonoma Co. 3).

Described from the male, the terminal dorsal segment being rather broadly emarginate, the emargination evenly rounded and feeble, about eight or nine times as wide as deep. The female is quite similar to the male, but has the antennæ normal in structure and slightly shorter; the vertex also lacks the two ciliate tubercles, and the median puncture of the pronotum appears to be less elongate.

Belongs near *compar* Lec., but is abundantly distinguished from that species by the structure of the antennæ and the darker colors.

R. franciscana n. sp.—Form rather slender, black; antennæ brownish-piceous; elytra dark rufous; legs dark piceous-brown; under surface black;

integuments polished; pubescence fine, short, subrecumbent, rather dense. *Head* moderate, slightly wider than long; eyes moderate, at less than their own length from the base; sides strongly rounded to the base, which is very broadly truncate or just visibly sinuate; surface feebly convex, finely, evenly and distinctly punctate; occipital foveæ rather small, feebly impressed, on a line through the middle of the eyes, mutually slightly more than twice as distant as either from the eye; apical fovea wanting; vertex broadly, feebly sinuate above, abruptly and very strongly declivous, the face of the declivity bearing a transversely oval sensitive area of very dense, erect, short setæ; antennæ rather short and robust, about as long as the head and prothorax together, club somewhat robust; two basal joints, rather small, the second slightly the smaller, third narrower, slightly longer than wide, perceptibly obconical, fourth very slightly wider, a little transverse, fifth slightly dilated, a little longer than wide, seventh and eighth equal, a little narrower, very slightly narrower than long; joints eight to eleven uniformly, rather rapidly increasing in width, eighth as wide as the seventh, eight to ten wider than long. *Prothorax* widest at two-fifths its length from the apex, where it is scarcely perceptibly wider than the head and distinctly wider than long; sides strongly, evenly rounded, moderately convergent and nearly straight toward base; the latter broadly, feebly arcuate, four-fifths as wide as the disk, one-half wider than the apex; the latter transversely truncate; disk strongly convex, finely, rather densely and evenly punctate, lateral foveæ rather large, moderately impressed, at slightly more than one-third the length from the base; median very small, near the base. *Elytra* at base slightly wider than the prothorax, at apex scarcely twice as wide as the latter; sides evenly and rather strongly arcuate; disk very slightly wider than long, moderately and evenly convex, very minutely, not densely punctate; sutural striæ deep, nearly parallel; discal distinct, arcuate, terminating at slightly less than one-fifth the length from the apex. Abdomen moderately convex; basal segment nearly as long as the next two together; basal carinæ very fine, very distinctly divergent, distant by about one-fourth the total width, slightly less than one-third as long as the segment. *Legs* short and robust; intermediate tibiæ short, robust, not at all clavate, slightly thicker in the middle, having a large, robust terminal spur; posterior tibiæ longer, more slender, slightly clavate. Length 1.3 mm.

California; (San Mateo Co. 1).

The description is taken from the male. The terminal segment is rather broadly and extremely feebly emarginate at apex.

This species belongs near the last, but may easily be distinguished from any hitherto described by its colors, punctuation and male sexual characters. The female probably

has simple antennæ and lacks the sensitive oval patch on the declivity of the vertex.

R. deformata Lec.—Three specimens of this species were taken at Paraiso Springs, Monterey Co. The antenna is figured on the plate; the abnormally large second joint is excavated and coarsely punctured beneath.

SONOMA n. gen. (Euplectini.)

The following genus belongs near *Faronus* and *Sagola*, with apparently much greater resemblance to the latter. The species thus far described belong to the Pacific Coast fauna, and were placed by Dr. LeConte in *Faronus*. The diagnosis may be given as follows, the general characters being those of the Euplectini.

Posterior coxæ contiguous; tarsi with two equal claws. Antennæ rather distant at base, feebly but distinctly clavate; first joint much longer than the second. Head slightly smaller than the prothorax, with three nude foveæ not connected, the two posterior small, the apical large and very deep; genæ not at all prominent, rounded. Prothorax with two small discal foveæ before the middle, a very large, deep, widely dilated basal fovea, and one at each side not connected. Elytra with sutural striæ; discal deep and broad, short, basal. First segment of the abdomen very short, shorter than the second or third, coriaceous above, corneous beneath, without basal carinæ; second segment having an apical transverse line of finely spongiöse sensitive surface which is interrupted in the middle. Tarsi rather short. Eyes well developed. Body very depressed, linear.

The head is not carinate beneath, but has a deep transverse groove just behind the mentum and maxillæ. The elytra are much longer than the prothorax, depressed. The flanks of the elytra are normal. The middle coxæ are subcontiguous, separated by a very narrow carina.

The genus *Sonoma* is distinguished from *Faronus* by the form of the genæ and the short basal segment of the abdomen; from *Sagola* Sharp it differs in its less approximate and less prominent frontal tuberculations, and especially in the structure of the antennæ, which are in *Sagola* not at all clav-

ate; the three outer joints in Sonoma are distinctly enlarged, forming a loose club.

The transverse areas of sensitive surface near the apex of the second dorsal segment are analogous to similar transversely oval patches previously noticed by me as being very common in the Homalini of the Staphylinidæ, and they probably serve the same purpose in each group. They have been noticed by Dr. Sharp in Sagola. Although both the species of Sonoma before me have these sensitive patches, I am not certain that their presence is constant throughout the genus.

OROPUS n. gen. (Euplectini.)

Tarsi with two unequal claws, posterior coxæ very closely approximate. Maxillary palpi moderate in length, fourth joint rather elongate and spindle-form, widest near the middle, bristling with minute setæ at apex. Head with two small occipital foveæ, which are spongiose and connected by an arcuate, impressed groove; antennæ similar in the sexes; eyes well developed. Prothorax with two lateral spongiose foveæ at base, connected by a deeply impressed line, also with an impressed median canaliculation; sides near the base with a small, acute, reflexed tooth. Elytra with acute lateral margin; each having four deep punctures at base, prolonged posteriorly as fine distinct striæ. Abdomen with a short basal segment, hidden by the elytra above, visible beneath, not extending beyond the coxæ; second segment long, more than twice as long as the third. Tarsi three-jointed; basal joint very small, second very long. Abdomen strongly margined above. Body rather robust and convex.

This genus belongs to the Trichonyx group of the Euplectini, but differs greatly from that genus in the position of the posterior coxæ, which are here very narrowly separated, almost contiguous at base. In Trichonyx they are quite distant, more than three times as distant as in the present genus. Oropus belongs near Trogaster Sharp, and differs from it in the form and position of the pronotal teeth. In addition, the following characters distinctive of Trogaster are not found in Oropus:—Antennæ dissimilar in the sexes; fourth joint of maxillary palpi rather short, widest near the base; head with two small occipital foveæ, which

are not spongiose, and not connected by the anterior arcuate groove, the latter terminating posteriorly in two very deep foveæ just in advance of the occipital pair. Elytra each with three foveæ at base, the lateral prolonged posteriorly in two divergent striæ.

The structure of the abdomen differs decidedly in the two genera, although *Trogaster* has the short basal segment, the second ventral is but very little longer than the third. In *Trogaster* the first three visible dorsal segments are nearly equal; in *Oropus* these decrease uniformly and rapidly in length. *Amauronyx* agrees well with the present genus in abdominal structure, but has the posterior coxæ separated as in *Trichonyx*, the elytra with but two basal foveæ, and the pronotum without lateral teeth.

I have drawn my comparisons from specimens of *Amauronyx Maerkeli* Aub.; *Trichonyx sulcicollis* Reichb., and *Trogaster aberrans* Sharp, very kindly given me, together with many other Pselaphides and Scydmaenides, by Capt. Ch. Kerremans of the Belgian army.

Oropus has thus far occurred only on the Pacific Coast; one species has already been described by Dr. Le Conte under the name of *Trichonyx striatus*; I now add three others from more southern latitudes, of which *convexus* is assumed to be the type of the genus.

In the following descriptions the elytral striæ are designated by the numbers one to four, in order from the suture outward.

The four species may be distinguished as follows:—

Elytral striæ two and three subequal, extending distinctly behind the middle.

Pronotal canaliculation not interrupted before the transverse basal groove.

Canaliculation dilated anteriorly.....**striatus.**

Canaliculation not dilated anteriorly, coarse, dilated in the middle,
convexus.

Canaliculation completely interrupted behind the middle...**interruptus.**

Elytral striæ two and three unequal, shorter.....**abbreviatus.**

These species, with exception of the first, which was described by Dr. Le Conte from Vancouver Island, were all taken in wet moss at the bottom of ravines near the sea-coast, and within a very limited area. I have met with them in no other locality.

O. convexus n. sp.—Form rather robust, convex, dark rufo-castaneous; elytra scarcely perceptibly paler, dark rufous; legs and antennæ slightly paler, rufous; pubescence coarse, rather long, not very dense; integuments polished. *Head* robust, much wider than long; eyes moderate, prominent, at their own length from the base; sides behind them strongly convergent and arcuate to the base, which is about one-half as wide as the width at the eyes; impressed groove strongly arcuate; occiput with a narrow canaliculation in the middle at base; antennæ robust, short, as long as the head and prothorax together; basal joint robust, longer than wide, distinctly narrowed toward base, second slightly narrower, cylindrical, as long as wide, three to eight slightly narrower than the second, gradually slightly shorter, third slightly wider than long, ninth and tenth abruptly much wider, short, transverse, the tenth slightly the larger, eleventh distinctly wider than the tenth, conoidal, acutely pointed, as long as the four preceding joints together. *Prothorax* widest slightly before the middle, where it is scarcely visibly wider than the head and nearly as wide as long; sides here very strongly rounded, thence rather strongly convergent and distinctly sinuate to the base; the latter broadly arcuate, two-thirds as wide as the disk, one-third wider than the apex; the latter feebly arcuate; sides toward the apex slightly sinuate. basal angles prominent, slightly obtuse, not at all rounded; disk broadly convex; canaliculation terminating at one-sixth the length from the apex, slightly dilated in the middle in the form of a small puncture, continued toward base beyond the transverse groove nearly one-half the distance between the latter and the base; transverse groove deeply impressed, very feebly posteriorly arcuate, at one-third the length from the base; lateral foveæ deeply impressed, spongiose; disk between transverse groove and base strongly convex; surface finely, sparsely punctate. *Elytra* at base slightly narrower than the prothorax, at apex one-half wider than the latter; sides rather strongly and nearly evenly arcuate; disk broadly and rather strongly convex, as long as wide; humeri longitudinally prominent but not carinate; sutural striæ very deeply impressed, entire, slightly arcuate, two and three equal, fine, strongly impressed, two-thirds as long as the disk, four short, arcuate, terminating slightly before the middle, fine, strongly impressed; surface rather finely, feebly and sparsely punctate. *Abdomen* slightly shorter and narrower than the elytra; border inclined, strong and conspicuous; surface broadly convex, very minutely, sparsely punctate. *Legs* moderate in length, slender; femora slender, very slightly clavate; posterior tibiæ nearly twice as long as the tarsi, very feebly dilated toward tip. Length 1.9–2.0 mm.

California; (Sonoma Co. 2).

The type is a male; the abdominal sexual characters are not very well marked and consist of a very small transverse impression beneath, near the apex. The under surface of the head is moderately convex, with a fine but distinct median carina; it is coarsely, rather deeply and not densely punctate.

The female which I have associated with this male is very slightly more depressed and very slightly more robust; the antennæ are shorter and more robust; the under surface of the head is more finely and feebly punctate; the median pronotal channel is finer and not so distinctly dilated in the middle; the elytral striæ are more feebly impressed; the pubescence of the body is slightly denser and the color is paler, especially that of the elytra, which is rather bright rufous. If the specimen were not a female I should not hesitate to describe it as distinct, but as the sexual characters in this genus are not known the above differences may be due simply to the usual sexual modification. The material before me is so limited that very little can be learned of specific variability, but in tabulating the species above I have made use only of those characters which are regarded as of great importance in other portions of the *Pselaphidæ*.

O. interruptus n. sp.—Moderately robust, convex, uniformly dark rufous; legs and antennæ very slightly paler; pubescence rather coarse, not long, moderately dense; integuments shining, pronotum slightly duller. *Head* much wider than long; eyes moderate, convex, at their own length from the base; sides behind them strongly convergent and arcuate to the neck, which is deeply impressed, broadly sinuate; occipital foveæ on a line through the anterior limits of the eyes; occiput with a narrow median canaliculation; antennæ rather robust, as long as the head and prothorax together; basal joint slightly robust, a little longer than wide, second very slightly narrower, cylindrical, scarcely as wide as long, three to eight very slightly narrower, decreasing in length, third distinctly wider than long, nine and ten rather abruptly longer and much wider, transverse, tenth distinctly longer and slightly wider than the ninth, eleventh more robust than the tenth, elongate, conoidal, slightly obliquely pointed, scarcely as long as the four preceding together. *Prothorax* widest at a little more than one-third its

length from the apex, where it is distinctly wider than long, very slightly wider than the head; sides strongly rounded, thence convergent to the basal angles, bisected by the lateral teeth, very feebly sinuate between the teeth and the basal angles; base broadly arcuate, two-thirds as wide as the disk, one-third wider than the apex; disk broadly convex; canaliculation abrupt, rather narrow and deep, beginning slightly behind the apex, abruptly terminating at the middle; transverse groove deeply impressed, broadly, feebly arcuate, at distinctly less than one-third the length from the base, prolonged posteriorly in the middle in a deep broad channel nearly half way to the base. *Elytra* at base nearly equal in width to the pronotum, at apex nearly one-half wider than the latter; sides evenly and strongly arcuate; humeral prominences convex, strong, elongate; disk slightly wider than long, rather strongly convex, broadly impressed along the suture; striæ one strongly impressed, fine, two and three approximate, equal, fine, distinct, two-thirds as long as the disk, four fine, deeply impressed, one-third as long as the disk; surface rather coarsely, feebly and sparsely punctate. *Abdomen* broadly convex, impunctate; border strong, rather strongly inclined. *Legs* moderate in length. Length 1.9 mm.

California; (Sonoma Co. 1).

The type is a male. The species is easily distinguished from *convexus* by the shorter and less robust basal joint of the antennæ, more broadly and evenly arcuate impressed frontal groove, short pronotal canaliculation, broader median posterior continuation of the transverse groove, and by the color, which is more uniform and paler rufous.

O. abbreviatus n. sp.—Rather robust, moderately depressed, very dark rufo-testaceous; antennæ and legs concolorous; elytra scarcely perceptibly paler; integuments polished; pubescence coarse, rather long and somewhat dense. *Head* much wider than long, neck one-half as wide as the width at the eyes; surface almost impunctate; frontal impressed channel very strongly arcuate; antennæ as long as the head and prothorax together, moderately robust; basal joint robust, longer than wide, second slightly narrower, a little longer than wide, third very slightly wider than long, ninth and tenth abruptly wider, subequal in length, the latter very slightly the wider, eleventh slightly wider than the tenth, ovoidal, symmetrically pointed, scarcely as long as the preceding four together. *Prothorax* widest very slightly before the middle, where it is as wide as long; sides very strongly arcuate, convergent and very feebly arcuate to the apex, sinuate near the latter, less strongly convergent toward the base, strongly sinuate just before the latter; base broadly arcuate, three-fourths as wide as the disk, one-half wider than the apex; disk broadly convex; median canaliculation rather fine but deeply impressed, beginning near the apex, continuous in width and depth across the

transverse groove nearly one-half the distance between the latter and the base; transverse groove deeply impressed, at slightly more than one-fourth the length from the base, feebly, posteriorly arcuate; lateral foveæ rather large, moderately impressed. *Elytra* at base slightly narrower than the pronotum, at apex one-half wider than the latter; sides evenly and rather strongly arcuate; humeral prominence convex, elongate; disk very finely, sparsely punctate, nearly as long as wide, moderately and nearly evenly convex; stria one deeply impressed, entire, two and three very closely approximate, finely impressed, distinct, the former three-sevenths, the latter four-sevenths as long as the elytra, four fine, deeply impressed, more divergent, one-third as long as the disk. *Abdomen* slightly narrower and much shorter than the elytra; border strong. *Legs* slender. Length 1.8 mm.

California; (Sonoma Co. 1).

This species, which is represented by the male, is easily distinguished from the others by the brevity of the second and third elytral striæ. It is further distinguished by the shape of the pronotum and by the form of the frontal impressed groove, which is here very strongly arcuate, more so than in *convexus*.

The antennæ are very similar in structure throughout, but present slight differences mainly affecting the first, ninth, tenth and eleventh joints.

ACTIUM n. gen. (Euplectini.)

The Californian species hitherto placed in *Trimium* in reality form a very distinctly characterized genus. In the following comparative statement, I have had before me a male and female of the European *Trimium brevicorne* Reichb. which was taken by Aubé as the generic type. In *Trimium* as thus represented, the eyes are very unequal in the sexes, in the males being moderate in size, in the females much smaller. The pronotum is crossed by a very fine, feebly impressed, basal groove. The flanks of the elytra are perfectly devoid of humeral foveæ. The first visible dorsal segment is elongate, equal in length to the next two together.

The generic character of *Actium* may therefore be briefly given as follows:—

Maxillary palpi rather small, second joint very strongly clavate, third minute, subglobular, fourth elongate, oval, moderately robust, longer than the remainder taken together. Basal groove of pronotum very strong and deeply impressed. Eyes rather large, convex and prominent in both sexes. Elytra having on the flanks, just behind each humeral prominence, a large spongiose fovea, which is continued to the elytral apex by a broadly and deeply impressed groove, limited inferiorly by a fine acute ridge. First three visible dorsal segments of the abdomen subequal, first slightly the longer.

Actium differs from *Euplectus* in its more abrupt terminal joints of the antennæ, in the presence of spongiose foveæ on the head, in the very much more robust and convex form of body, and in the structure of the abdomen. In *Euplectus*, as represented by *Bonvouloiri* Reit. and *signatus* Reichb. the first three visible dorsal segments are equal, the fourth very much longer; the second and third ventral segments are equal in length. In *Actium* the fourth visible dorsal is but very slightly longer than the third, and the second ventral is distinctly longer than the third. It will be seen therefore that the genus *Actium* properly occupies a position intermediate between *Trimium* and *Euplectus*.

The sexual characters at the apex of the venter are usually quite complex.

It is highly probable that our eastern representatives of *Trimium* will also necessitate the founding of a separate genus, although this cannot be definitely stated at present.

LOMECHUSA Grav.

L. montana n. sp.—Robust, rather depressed; sides parallel; pale rufo-testaceous throughout; antennæ and legs concolorous; pubescence very fine, sparse, abdomen polished, almost glabrous; anterior portions finely alutaceous, elytra more shining than the pronotum; under surface polished. *Head* small, much wider than long; eyes rather large and prominent, at nearly their own length from the base; sides behind them nearly parallel; very feebly arcuate; front with a large deep impression; entire surface very minutely granulose and excessively minutely, not densely punctate; antennæ very slender, not incrassate, two-thirds as long as the body; basal joint very large, twice as long as wide, rather abruptly narrowed at the base, not as long as the next three together; second slightly longer than wide, not one-half as wide as the first, scarcely two-thirds as long as the third; joints three to seven

equal, seven to ten very slightly decreasing in length, eleventh long and slender, attenuate; apices of joints three to ten obliquely truncate. *Prothorax* twice as wide as the head; apex throughout the breadth of the latter broadly, roundly emarginate; apical angles thence very broadly rounded, coarctate with the sides which become nearly straight and slightly divergent to within a short distance of the base, where they become abruptly slightly convergent and nearly straight to the basal angles; the latter obtuse and scarcely rounded; base broadly and strongly arcuate in the middle, sinuate laterally; disk twice as wide as long, depressed in the middle, very broadly and strongly reflexed at the sides, extremely feebly reflexed anteriorly, more strongly and broadly so along the arcuate portion of the base, also more strongly impressed at the sides and toward the apical angles, very minutely subgranulose with evenly distributed, not dense, fine, granulose or strongly asperate punctures. *Elytra* as wide as the prothorax; sides nearly parallel, feebly arcuate; apex broadly truncate, feebly sinuate laterally; inner angles distinctly rounded; humeri rather broadly rounded; disk nearly two-thirds wider than long, one-third longer than the pronotum, feebly convex, more strongly so toward the humeri; base feebly declivous, finely, feebly subgranulose, finely, rather sparsely granulosely punctate; punctures more distinct than those of the pronotum; suture margined with a fine, polished but not distinctly elevated line which extends along the scutellum and base. *Abdomen* as wide as the elytra; sides nearly straight and parallel; broadly, obtusely rounded behind; surface strongly impressed in the basal half, broadly, feebly convex behind; lateral tufts of hair bright fulvous; under surface strongly convex, having very sparsely placed, erect setæ. *Legs* long and slender; tarsi cylindrical; first joint of the posterior longer than the next two together, one-third longer than the fifth. Length 4.3 mm.

California; (Truckee, Nevada Co. 1). Elevation 6,000 feet.

A very interesting addition to the fauna of California; the typical representative was found under a stone deeply imbedded in soft soil near the margin of a small stream; no ants of any description could be seen, and in fact myrmecophilous Coleoptera of all kinds appear to be extremely rare on the Pacific Coast.

TACHYUSA Erichs.

T. crebrepunctata n. sp.—Rather slender, moderately convex, black throughout; antennæ and legs same; tarsi and palpi paler, piceo-testaceous; pubescence short, fine, dense and recumbent, coarser, longer and more sparse on the abdomen; integuments shining, finely, deeply, evenly and very densely punctate, head and abdomen slightly more coarsely and sparsely

so. *Head* and labrum together slightly longer than wide; front and occiput strongly convex and declivous at the sides, flat above; eyes large, at scarcely their own length from the base; sides behind them slightly convergent, strongly arcuate; base broad, truncate; antennæ slender, very feebly incrassate, scarcely as long as the head and prothorax together; second joint slender, elongate, much longer than the third; joints three to ten decreasing in length, the former more than twice as long as wide, the latter very slightly wider than long. *Prothorax* slightly wider than long, widest at one-third its length from the apex, where the sides are rather broadly arcuate, thence rather strongly convergent and nearly coarcately rounded to the apex, and slightly less strongly convergent and feebly sinuate to the base; the latter broadly and strongly arcuate throughout, four-fifths as wide as the disk and slightly wider than the apex; the latter broadly and feebly arcuate throughout; basal angles very obtuse and distinctly rounded; disk broadly and rather strongly convex, depressed in the middle toward base, and immediately before the basal margin transversely and feebly impressed. *Elytra* at base one-fourth wider than the pronotum; sides nearly parallel, feebly arcuate near the base, strongly so near the apex; apical angles acute and slightly produced; together subtruncate behind, feebly emarginate at the suture; disk nearly quadrate, two-fifths longer than the pronotum, feebly and nearly evenly convex; suture very finely margined. *Abdomen* distinctly narrower than the elytra; sides parallel and nearly straight; border wide and prominent; surface feebly convex; three basal segments rather deeply impressed at base but not more densely or coarsely punctate, not carinate in the middle. *Legs* moderate in length, very slender; tibiæ densely herissate with coarse, semi-erect setæ; joints of the posterior tarsi decreasing rather rapidly in length, first nearly one-half longer than the second. Length 2.5 mm.

California; (Monterey Co. 1).

This species is rather closely allied to *T. Harfordi*, but differs in its smaller size, shorter, smaller and more transverse prothorax, and denser and stronger punctuation.

The middle coxæ are distinctly although not widely separated; the mesosternal process is rather short, broadly angulate, the apex of the angle being broadly rounded; the connecting surface is deeply impressed

AUTALIA Leach.

A. elegans n. sp.—Rather slender and depressed; head and abdomen toward tip piceous-black, remainder dark piceo-castaneous; antennæ dark fuscous throughout; legs rather pale brownish-flavate; pubescence fine, sparse, long and distinct; integuments polished. *Head* slightly longer than wide; semicircularly rounded behind from eye to eye; surface strongly and evenly

convex, impunctate; antennæ distinctly longer than the head and prothorax together, distinctly incrassate toward the apex; three basal joints elongate, second very slightly shorter than the first or third, four to ten gradually shorter and wider, the former distinctly longer than wide, the latter slightly wider than long. *Prothorax* very slightly longer than wide; sides in the anterior third strongly convergent and nearly straight to the nuchal emargination which is broadly and feebly incurvate and one-third as wide as the disk; in the posterior two-thirds the sides are parallel, broadly and feebly incurvate at the posterior third, at the anterior third strongly rounded; disk transversely and rather strongly convex at the sides, feebly so in the middle, where there is a narrow, rather feeble canaliculation extending from near the apex to slightly behind the middle; also at the base four foveæ, the inner pair continued anteriorly and slightly obliquely nearly to the middle by narrow, deeply impressed canaliculations; the outer pair dilated laterally, and anteriorly, obliquely and briefly prolonged at their inner extremities; surface highly polished, finely and sparsely granulose in the middle toward base; basal margin broadly and feebly arcuate; angles right and very narrowly rounded. *Elytra* at base nearly one-half wider than the pronotum; sides nearly parallel, strongly arcuate toward apex; together subtruncate behind; disk feebly convex, abruptly and strongly so at the sides, impunctate; sutural striæ fine and distinct; each elytron strongly bifoveate at the base. *Abdomen* at base three-fourths as wide as the elytra; sides parallel and feebly arcuate; border narrow, deep and strongly inclined; surface feebly convex; first three segments transversely and very strongly impressed at base; impressed areas coarsely, strongly and densely granulose, traversed longitudinally by five carinæ, remainder of the surface scarcely punctate on the basal segments, finely, asperately and very sparsely so on the apical. *Legs* slender; first four joints of the posterior tarsi slightly elongate, nearly equal. Length 2.0 mm.

California; (Lake Co. 1). Mr. Fuchs.

The prosternum is well developed in front of the coxæ, slightly swollen, connected with the supracoxal surface by an even convexity without trace of raised line; between the coxæ it is produced back as an acute angle, strongly carinate in the middle and projecting under the apex of the mesosternum, the posterior edges of the supracoxal surface being narrowly and strongly reflexed; the portion behind the coxæ is membranous.

The mesosternum is ample, broadly arcuate and very narrowly reflexed anteriorly, finely carinate throughout along the middle, the surface on either side of the middle being broadly impressed for the reception of the anterior coxæ in

repose; posteriorly, between the widely separated middle coxæ, it is scarcely at all produced, but is very broadly arcuate, reflexed and far above and free from the long truncate metasternal process; the entire mesosternum is coarsely, strongly and densely granulose, forming a striking contrast to the highly polished pro- and metasterna.

The anterior and middle tarsi have each four distinct joints, but the long, very slender fourth joints are provided at base with a very small and ill-defined segment, which renders the accurate determination of the structure a matter of great difficulty⁵.

EUMITOCERUS n. gen. (Tachyporini.)

Head moderately deflexed; eyes adjacent to the prothorax; antennæ long, very slender, capillary, verticillate; two basal joints much more robust, first slightly less than twice as long as the second; labrum very small, much wider than long, arcuate anteriorly, strongly inflexed and hidden under the projecting clypeus; maxillary palpi long, filiform and slender; second joint long and very slender, third obconical, scarcely more than two-thirds as long as the second, fourth slender, finely acuminate, slightly swollen toward base, longer than the third, much more finely and densely pubescent. Pronotal hypomera extremely strongly inflexed, almost parallel with the dorsal surface; wide behind, very narrow anteriorly. Elytra passing a little beyond the metasternum. Anterior coxæ narrow, conical, convex anteriorly; posterior moderately prominent, conical posteriorly, emarginate externally; posterior femora and trochanters attached at the apices, their point of insertion not at all concealed. Ventral segments margined; sixth exposed dorsally. Tarsi five-jointed. Inguements asperate.

It can be readily seen that *Eumitocerus* bears a great resemblance to *Habrocerus*, but differs from that genus in the

⁵.—I cannot but agree with Wollaston in his statement (Cat. Can. Col., p. 535, foot-note), concerning the difficulties of the tarsal system as applied to the Aleocharini. In many of the minute species it is impossible to determine the number of tarsal joints in such manner as to leave no doubt in the mind of the investigator, because of the hairy vestiture and the apparent division of the terminal joint in many cases, which, as I have before remarked, may be indicative of a real division at an early period in the history of the species. The more the subject is investigated, the more apparent is it that the division of the Aleocharini in accordance with the number of tarsal joints, is neither scientific in indicating true affinities, nor practical in its application.

relatively much shorter third joint of the maxillary palpi, and more especially in the structure of the posterior coxæ. In appearance it differs considerably, by reason of its asperate sculpture, in this respect being apparently related to *Tricophya*. In the latter genus the elytra do not extend beyond the metasternum, and the third and fourth joints of the maxillary palpi are subequal in length.

There is at my disposal, unfortunately, but one specimen. I cannot therefore give a representation of the maxilla; the labial palpi appear to be very minute and are not distinctly visible in the type. From the cursory glance which I obtained before the antennæ were broken, I am confident that these are filiform and verticillate throughout.

E. tarsalis n. sp.—Form rather slender, dark castaneous; abdomen black, paler at the apex; legs pale piceo-testaceous; antennæ flavate, basal joints piceo-testaceous; pubescence fine, denser on the elytra, recumbent, brownish, not conspicuous; integuments very feebly alutaceous, shining. Head moderate, slightly wider than long, feebly and evenly convex; eyes small, convex, finely granulate, rather prominent; front feebly, densely and subasperately punctate; palpi testaceous; infraorbital ridge not visible. *Prothorax* widest at two-thirds its length from the apex, where the sides are obtusely subangulate and where it is nearly one-half wider than long; sides thence moderately convergent and feebly arcuate to the apex, slightly less strongly convergent and nearly straight to the base; the latter squarely truncate; basal angles obtuse and very slightly rounded; apex broadly and feebly emarginate, distinctly narrower than the base; disk evenly and moderately convex, obliquely and feebly impressed near each basal angle, very finely, rather densely and evenly punctate; punctures strongly asperate. Scutellum rather large, as wide as long, asperate. *Elytra* at base as wide as the base of the pronotum; sides feebly divergent, nearly straight toward the base, feebly arcuate posteriorly; together as long as wide, broadly sinuate at apex, nearly one-half longer than the pronotum; disk feebly, transversely convex, finely, rather densely and evenly punctato-asperate; punctures slightly coarser than those of the pronotum. *Abdomen* at base very slightly narrower than the elytra; sides rather strongly convergent toward apex and nearly straight; border moderate, feeble on the fifth segment; surface transversely and moderately convex, even, minutely, very feebly and rather densely punctato-asperate at base, the punctures becoming more minute and sparse toward the vertex; under surface more coarsely and strongly punctato-asperate toward the base, sculpture subimbricate. *Legs* moderate, anterior short, rather robust, remainder slender; posterior tarsi long, much shorter than the tibiæ,

very slender, first joint longer than the next three together, as long as the last three. Length 1.8 mm.

California; (San Mateo 1). Mr. C. Fuchs.

The type of this interesting species is probably a male. The tarsi are very remarkable; the anterior are irregular, attached obliquely to the tibiæ, and have the basal joint large, broadly dilated and slightly darker in color; the next three joints are very small, emarginate at tip, pale flavo-testaceous in color, and moderately dilated, successively less strongly so; the fifth slender. The intermediate tarsi are irregular and are very distinctly dilated toward base; both the anterior and middle tarsi are densely clothed beneath with very slender papillæ, and are verticillate at the sides; the papillæ beneath are sometimes terminated by very minute enlargements which are apparently composed of a viscid substance, and analogous to the erect setæ observed upon the under surface of the head in the Euplectini of the Pselaphidæ. The claws are very small. There are no sexual characters of importance observable at the abdominal vertex.

HETEROTHOPS Steph.

H. exilis n. sp.—Form very slender, rather convex; pale reddish-testaceous throughout; head slightly darker, more castaneous; antennæ and legs slightly paler, pale flavate; integuments polished; head and pronotum glabrous; elytra and abdomen finely and rather densely pubescent, the elytra the more sparsely so. *Head* rather strongly deflexed, oblong, abruptly and feebly constricted at the neck; sides thence to the eyes feebly convergent, feebly arcuate, twice as long as the eyes which are small, not at all prominent and almost at the apical angles; surface transversely and rather strongly convex, impunctate, finely and excessively feebly strigose; antennæ inserted at a very short distance from the eyes, shorter than the head and prothorax together; feebly incrassate; first joint as long as the next two together, third small, much shorter than the second, slightly longer than wide, tenth distinctly wider than long, eleventh slightly longer than the two preceding together. *Prothorax* scarcely longer, and, at the apex very slightly wider than the head, widest at the base where it is but very slightly wider than long; sides convergent from base to apex, broadly, evenly and distinctly arcuate; apex broadly and very feebly arcuate, three-fourths as wide as the base; the latter evenly and very

distinctly arcuate throughout; angles broadly rounded; disk transversely and rather strongly convex, impunctate, excessively minutely and obsoletely stri-gose with a few setigerous punctures along the sides and base and four discal punctures, one near each apical angle, and another just before and on either side of the centre of the disk. *Elytra* at base very slightly narrower than the prothorax; sides very feebly divergent, very feebly arcuate; together broadly and distinctly sinuate behind; disk very feebly convex, slightly wider than long, very slightly shorter than the pronotum, evenly, not very coarsely, deeply, moderately densely and asperately punctate; intervals extremely feebly reticulate. Scutellum rather large, triangular, asperate. *Abdomen* long, slender, at base nearly as wide as the elytra; apparently not capable of much contraction; sides gradually convergent and nearly straight to the apex; border rather wide, deep, nearly vertical; surface rather convex, finely and very densely punctate. Legs rather short and slender; first four joints of the posterior tarsi decreasing rapidly in length, first subequal to the fifth. Length 2.4 mm.

California; (Monterey Co. 1).

The single representative is probably a female; the anterior tarsi are slightly dilated; the seventh segment has four long, setigerous, anal styles, but both the dorsal and ventral plates of the sixth segment are broadly and evenly arcuate at apex.

It is related to *pusio* Lec., but differs in the arrangement and number of the occipital punctures; these are one at the middle of the upper margin of the eye and one below the posterior margin of the eye between the latter and the infraocular ridge; at the base on the sides there are a few very minute punctures, and a transverse row of large setigerous punctures immediately before the nuchal constriction extending across the head.

The type specimen was found under pine bark early in February near the town of Monterey.

ABABACTUS Sharp.

A. pallidiceps n. sp.—Slender, rather depressed, piceous; head rufo-testaceous; legs pale flavate; antennæ opaque, pale flavo-testaceous; head sometimes clouded in the middle of the disk; pubescence sparse throughout, fine; integuments polished. *Head* distinctly longer than wide; post-ocular portion slightly less than twice as wide as long, semicircularly rounded be-

hind; eyes large, at twice their length from the base, finely granulate; surface moderately convex, rather sparsely, unevenly and not deeply punctate; punctures varying in size; antennal tuberculations abrupt, small and strong, with the anterior edges acute and prominent; surface between them gradually and anteriorly declivous, transversely truncate at apex; labrum short and broad, acutely incised in the middle, finely, acutely and prominently bidenticulate, edge just without each tooth finely sinuate; fourth joint of the maxillary palpi small, much narrower than the apex of the third, conical, acute; antennæ long and slender, as long as the head and prothorax together, not incrassate; second joint distinctly shorter than the third, all the joints longer than wide. *Prothorax* nearly three-fourths as wide as the head; sides parallel, distinctly and almost evenly arcuate; base and apex almost equal in width, truncate; basal and apical angles equally and rather broadly rounded; disk cylindrically convex, one-half longer than wide, coarsely, feebly and irregularly punctate; punctures sparse near the sides, more dense in an irregular line bordering the median impunctate area, which is very slightly more strongly convex throughout its length. *Elytra* at base one-third wider than the prothorax, slightly wider than the head; sides nearly parallel, extremely feebly arcuate; together broadly and very feebly emarginate behind; humeri very narrowly rounded; disk two-fifths longer than wide, nearly one-third longer than the prothorax, depressed, very feebly impressed toward base along the narrowly elevated suture, rather coarsely, feebly and evenly punctate; punctures impressed, distant by more than their own diameters, not appreciably more feeble toward apex. *Abdomen* slightly narrower than the elytra; sides parallel and straight; surface finely, more deeply, evenly and not densely punctate. Length 4.8-5.2 mm.

California; (Santa Rosa, Sonoma Co. 2; Anderson Val., Mendocino Co. 1)

In the male the second ventral segment has in the centre of its disk a small deep fovea bearing a small brush of erect hairs, the third segment having two similar foveæ, rather approximate, arranged transversely, distinctly before the middle, each bearing one or two erect robust setæ; sixth segment with a very narrow deep incisure, with the sides nearly parallel, very acutely rounded at apex and five times as deep as its mid-width, bordered throughout its length with a narrow, deeply concave gutter which is prolonged anteriorly, continuing thence as a single groove to the base of the segment, becoming gradually attenuated.

The prothorax is very slightly narrowed toward apex, the basal angles thus being more prominent than the apical.

The color may vary somewhat from immaturity, both the head and prothorax being sometimes paler. The single specimen upon which this statement is based differs, however, in its slightly denser elytral punctuation; it is probably a female, the sixth segment being entire, narrowly rounded at apex; the second segment is entire, but the third has the two foveæ as described in the male.

The present species belongs near *A. politus* Sharp, which it resembles greatly in sexual characters; from *nactus* Horn, it differs in color and in its much more elongate prothorax and elytra.

The genus *Ababactus* differs from *Hesperobium* not only in the structure of the labrum,—which allies it more closely with *Cryptobium*,—and tarsi, as remarked by Dr. Sharp, but also in the complete absence of the large basal carina of the first ventral segment, which is such a prominent feature of *Hesperobium*. The two post-ocular annular punctures are well developed in *Ababactus*, and are completely absent in *Cryptobium fracticorne* Payk.

LENA n. gen. (Pædeiniini.)

Body robust, depressed; head rather large; antennæ short and robust; labrum rather short, broadly rounded, with a simple median sinuation about twice as wide as deep with no trace of denticulation or carina; third joint of labial palpi very minute and slender; third joint of maxillary palpi much longer than the second, slender, fusiform, obtusely pointed at tip; fourth excessively minute, slender, subulate; eyes moderate, coarsely granulate. Prothorax subquadrate, narrowed toward base, shorter than the elytra. Intermediate and posterior tarsi rather slender, cylindrical; first joint of the latter as long as the next two together, distinctly longer than the fifth; fourth short, very slightly dilated, oblique at apex; anterior tarsi robust and spongy-pubescent beneath, very feebly dilated. Integuments rugulose, coarsely punctate, shining. Neck rather slender; gular sutures well separated.

This genus belongs near *Medon*, but is easily distinguished from it by a peculiar and complicated modification of the pronotal hypomera, the surface being deeply grooved opposite the base of the coxæ and the acute dividing line

being bisinuate anteriorly. It does not appear to be very closely allied to any of the Central American genera, and may be easily recognized by its short robust form, rather large truncate head, simple sinuate labrum, slender fusiform third maxillary palpal joint, short antennæ and non-carinate prosternum. I have compared it directly with *Medon brunneus* Erichs.

We have but one species.

L. testacea n. sp.—Robust; sides parallel; pale rufo-testaceous, elytra, legs, palpi and antennæ toward apex slightly paler and more flavate; pubescence of elytra and abdomen fine, rather long, not dense. *Head* about as long as wide; sides parallel, almost straight; base transversely truncate, feebly sinuate in the middle third; angles right, very narrowly rounded; eyes at twice their length from the base, slightly prominent; front finely subgranulose, coarsely, very feebly and not densely punctate, with a rather broad median impunctate line; antennæ equal in length to the head, distinctly incrassate toward tip; basal joint distinctly longer than the next two together, second distinctly longer and more robust than the third, the latter slightly longer than wide, joints four to ten subequal in length, increasing distinctly in width, the former as long as wide, the latter much wider than long. *Prothorax* widest at the anterior angles, slightly shorter and narrower than the head, very slightly wider than long; sides rather feebly convergent from apex to base, very feebly arcuate; base broadly subtruncate; angles rather broadly rounded; anterior angles rather more narrowly rounded; sides of apex very strongly convergent to the neck, nearly straight; nuchal truncation rather feebly sinuate, two-fifths as wide as the disk; the latter feebly and evenly convex, finely subgranulose, rather coarsely, evenly and feebly punctate; punctures denser and finer than those of the head, with scarcely a trace of a median impunctate line. *Elytra* at base very slightly wider than the prothorax, as wide as the head; sides very feebly divergent, nearly straight; together broadly and extremely feebly emarginate behind; disk as long as wide, one-third longer than the prothorax, very feebly convex, scarcely impressed along the suture, which is bordered with a thickened but scarcely elevated margin; surface not granulose, polished, rather finely, evenly and not densely punctate, punctures impressed, deeper but not as large as those of the pronotum. *Abdomen* very slightly narrower than the elytra; sides parallel and distinctly arcuate; border rather narrow, deep and strongly inclined; surface broadly convex, very finely and feebly reticulate, polished, excessively minutely and rather sparsely punctate, each puncture being entirely filled by a hair. *Legs* rather short and very slender. Length 2.2 mm.

Texas; (Austin 2).

There is unfortunately no male of this genus yet discovered; the sixth segment of the female is short and broad, very broadly and feebly rounded nearly throughout its width at apex, subtruncate. The species may perhaps prove to be apterous.

RAMONA n. gen. (Pæderini.)

This genus belongs to the Lithocharis and Medon division of the Pæderini, and is allied somewhat to Caloderma and to several genera recently described from Central America. It may be distinguished by the following characters:—

Head smaller than the prothorax; the latter quadrate, shorter than the elytra. Labrum entire, short, broadly rounded throughout, without inequality except some very minute and feeble undulations, three or four in number near the middle, having dorsally a small median carina; neck rather slender, one-third as wide as the prothorax. Anterior tarsi broadly dilated; posterior slender, cylindrical, first four joints decreasing very rapidly in length, first nearly as long as the next two together, fourth cylindrical, very slightly longer than wide. Head and pronotum without trace of median impunctate line, stria or elevation; integuments extremely finely and densely punctate, alutaceous. Eyes moderate in size, coarsely granulated.

The third joint of the maxillary palpi is rather more strongly dilated than is usual in this group, the fourth being normal. The elytra differ from those of many allied genera in having no sign whatever of the usual narrow elevated margin adjoining the suture. The genus is distinguished from Medon and Caloderma by many characters, the most important of which is the strong dilatation of the anterior tarsi.

The sexual modification of the male is very slight, consisting of a simple broad sinuation at the apex of the sixth segment, the fifth being entire.

But one species is known at present.

R. capitulum n. sp.—Rather slender and depressed, black throughout, apical edges of the ventral segments paler; intermediate and posterior legs

piceous, anterior legs and tarsi throughout paler, piceous-brown; palpi piceous; antennæ piceous, paler toward tip; pubescence extremely short, fine and excessively dense on the elytra and abdomen, much less dense anteriorly. *Head* small, as wide as long; sides behind the eyes very slightly divergent posteriorly, feebly arcuate; base truncate; angles not prominent, rather broadly rounded; front evenly and feebly convex, excessively minutely and densely punctate; antennæ rather long, slender, as long as the head and prothorax together, not incrassate; basal joint scarcely as long as the next two together, second three-fourths as long as the third, scarcely as long as, but slightly more robust than the fourth, joints four to six equal, twice as long as wide, six to ten decreasing in length, the latter scarcely as wide as long. *Prothorax* widest in the middle, where it is distinctly wider than the head; sides parallel, feebly arcuate; base and apex broadly arcuate, the latter very feebly so; basal angles broadly rounded; apical more narrowly so; disk as wide as long, feebly and evenly convex, excessively minutely, evenly and densely punctato-granulose. *Elytra* at base just visibly wider than the prothorax; sides nearly parallel, feebly arcuate; together broadly and very feebly emarginate behind; disk slightly longer than wide, nearly one-fourth longer than the prothorax, feebly convex, not appreciably impressed along the suture, excessively densely and very finely granulose, each granule bearing a minute hair. *Abdomen* not narrowed toward base; sides parallel and straight border narrow, erect; surface feebly, cylindrically convex, excessively minutely, feebly and densely punctate; punctures slightly asperate and not arranged in any order. *Legs* rather short and robust; first joint of the posterior tarsi fully as long as the fifth. Length 3.7 mm.

Nevada; (Reno 1).

The unique specimen is a male, the sinuation of the sixth segment being about four times as wide as deep and acutely rounded.

The pronotum has besides the regular system of excessively minute granulate punctures, a widely and irregularly scattered system of larger, though still very small, rounded, shallow punctures, each of which bears a small, erect seta. The elytra are opaque, the head and prothorax somewhat shining.

LEPTOGENIUS n. gen. (Pæderini.)

Body slender, roughly sculptured. Head large, borne on a narrow neck. Prothorax small. Elytra longer and wider than the pronotum. Abdomen as wide as the elytra, gradually decreasing in width toward apex; four basal segments equal in length; fifth nearly one-half longer than the fourth; sixth

very short. Antennæ short; basal joint very robust. Maxillary palpi large; basal joint small, slender, second longer, robust, sublunate, third very large, flattened, subsecuriform, much longer than the first two together, fourth very minute, in the form of a very short robust spine, erect, protruding from the apex of the third. Labial palpi extremely small, slender; third joint apparently long and slender, second scarcely shorter and distinctly more robust, basal joint not visible. Mandibles long and slender. Gular sutures contiguous throughout. Labrum short, very broad, strongly arcuate, with a minute median emargination slightly wider than deep, on each side of which there are two exceedingly minute, approximate and robust teeth, upper surface having a fine median, longitudinal carina. Legs slender; anterior tarsi not at all dilated; first four joints of the posterior decreasing uniformly and rapidly; in length, first slightly longer than the fifth. Prosternum having a fine, strongly elevated, median carina, slightly less elevated at the anterior margin; under surface of the neck carinate.

The exact relationship of this genus is not apparent; it is different in appearance from any of the other *Pæderoid* genera with which I am familiar, and in fact appears to be a transitional form having uncertain affinities. The labial palpi are very minute and in their position in the two representatives before me are so deeply placed that it is impossible to give their exact structure.

The principal points of departure from the normal *Pæderi* are in the peculiar short antennæ and spiniform—not subulate, oblique and retractile—terminal joint of the maxillary palpi, also in the large third and small robust second joint of that organ. The coxæ are normally *Pæderoid*.

***L. brevicornis* n. sp.**—Slender, pale ochreous-testaceous throughout; elytra slightly darker, castaneous except near the base; pubescence extremely short, sparse, very evenly distributed throughout; integuments thick, opaque, very coarsely scabrous, not at all shining. *Head* slightly longer than wide; sides parallel, nearly straight; base truncate, narrowly and distinctly sinuate in the middle; angles moderately broadly rounded; surface transversely and moderately convex, coarsely and very densely granulose; eyes moderate, slightly convex, on the sides at a little less than twice their length from the base, very coarsely granulate; antennæ a little shorter than the head, distinctly clavate, funicle slender at base, posteriorly and strongly geniculate; basal joint robust, one-half longer than wide, second slightly less robust, subglobular, three to six very small, very slightly wider than long, equal, scarcely more than one-half as wide as the second, seventh slightly wider,

seven to nine increasing rather rapidly in width, ninth and tenth strongly transverse, equal, a little longer than the third, together scarcely as long as the eleventh, which is ovoidal and pointed. *Prothorax* widest at one-third its length from the apex, where it is very slightly narrower than long; sides thence very strongly convergent and broadly sinuate to the apex which is slightly produced, truncate at tip and less than one-third as wide as the disk; sides in the posterior two-thirds rather rapidly convergent to the base and very feebly arcuate; apical angles obtuse, rather narrowly rounded and somewhat prominent; basal rather broadly rounded; disk feebly convex, feebly and broadly ridged along the middle especially in the basal half where it is broadly and feebly biimpressed. *Elytra* at base distinctly wider than the pronotum; sides very feebly divergent, feebly arcuate; together broadly, angularly and feebly emarginate behind; disk quadrate, subdepressed, very slightly longer than the pronotum, coarsely and very closely granulate; on each elytron there is a very feeble impression extending from the scutellum slightly obliquely and near the suture nearly to the apex. Scutellum very indistinct, small, rounded. *Abdomen* at base as wide as the elytra, and, at the apex of the first segment, slightly wider; sides gradually convergent and slightly arcuate to the apex; border strongly inclined and very distinct; surface moderately convex, coarsely and densely ruguloso-granulate. Under surface of the head coarsely and closely punctate; punctures round, variolate and almost in contact; under surface of the abdomen shining, rather finely punctate; punctures asperate and arranged in wavy, interrupted, transverse rows. Length 1.7-2.0 mm.

Texas; (Galveston 2).

The sculpture of the pronotum consists of a very minute reticulation of coarse strongly elevated lines.

The sexual characters are very feeble; the type is a male and has the apex of the sixth segment broadly truncate or excessively feebly sinuate throughout; in the female the sixth segment is longer and extremely feebly angulate throughout its width at apex. The male is much smaller than the female.

The two representatives of this very interesting species were found in detritus and rubbish on the inner side of the sand dunes lining the ocean beach. It is the smallest *Pæderide* described from the United States.

SCOPEUS.

The genus *Scopæus* of Erichson was distinguished from the other *Pæderoid* genera by a remarkable character relat-

ing to the ligula, which organ is here, in opposition to the general rule, tricuspid at the apex. Many representatives having the tricuspid ligula are found in America, and as they are all small and generally possess some of the characteristics of *Scopæus*, such as the narrow neck, they have been assigned to that genus without due consideration. Upon examination these various forms are found to differ considerably in structure, so much so in fact that the desirability and propriety of generically separating them can no longer be doubted; several of the more markedly distinct groups have already been noticed. Diagnoses of the genera which inhabit the United States, may be stated as follows:—

Posterior angle of prosternum prominent, the lower edge of the intercoxal lamina being reentrant or inwardly arcuate at and near its vertex and not longitudinally continuous in curvature with the prosternum. Anterior angles of prothorax very broadly rounded or obsolete.

Posterior under side-pieces of pronotum well developed. Surface punctate or alutaceous *Scopæus*.

Posterior under side-pieces rudimentary. Surface polished and nearly impunctate throughout..... *Scopæodera*.

Posterior angle of prosternum not prominent, the lower edge of the intercoxal lamina being outwardly arcuate at and near the angle and longitudinally continuous in curvature with the prosternum. Anterior angles of the prothorax more or less prominent. Posterior under side-pieces of the pronotum rather well developed.

Neck very slender; integuments excessively minutely punctate, alutaceous..... *Leptorus*.

Neck broader; integuments coarsely punctate, polished..... *Orus*.

The generic characters of *Scopæus* have been taken from a typical representative of *S. levigatus* Gyll., for which I am indebted to M. A. Sallé.

SCOPÆUS Erichs.

Several American species are assignable to this genus, among others *opacus* Lec. The following species of the Pacific Coast may also be placed here at present.

S. rotundiceps n. sp.—Rather slender, black; legs castaneous, paler toward tip; antennæ and palpi rufo-fuscous, the former paler and flavate at the apex; pubescence fine, short, very dense, more sparse on the pronotum, most conspic-

nous on the head; integuments shining. *Head* distinctly longer than wide, semicircularly rounded behind from points slightly behind the eyes; sides parallel and nearly straight; surface rather strongly convex, very minutely and densely punctate; punctures much feebler and sparser along the middle; antennæ slightly shorter than the head and prothorax together; first joint but very slightly longer than the second and third together, the latter subequal in length, the second joint somewhat more robust, joints three to ten decreasing rather rapidly in length, the former distinctly longer than wide, the latter slightly wider than long. *Prothorax* distinctly narrower than the head, two-fifths longer than wide, widest in the middle; sides in the anterior third rather strongly convergent and very feebly sinuate to the nuchal emargination which is narrow and deeply sinuate; sides in the posterior two-thirds rather feebly convergent and broadly arcuate throughout; anterior angles extremely obtuse and broadly rounded, almost obsolete; posterior broadly rounded; base extremely feebly arcuate; disk transversely and moderately convex, very minutely and not very densely punctate; punctures subasperate, evenly distributed; a narrow line along the middle impunctate; at the base there is a very fine median carina. *Elytra* at base nearly one-third wider than the prothorax; sides nearly parallel, feebly arcuate posteriorly; together broadly, angularly and extremely feebly emarginate behind; disk feebly convex, slightly longer than wide, distinctly longer than the pronotum, feebly impressed on the suture toward base, rather coarsely and densely punctate toward the suture and base, excessively minutely and slightly more sparsely so exteriorly and apically; suture finely margined with a narrow elevated border which is depressed and much narrower at the scutellum. *Abdomen* at base slightly narrower than the elytra; sides very feebly divergent and nearly straight to the apex of the fourth segment; fifth as long as the two preceding together; surface broadly and feebly convex, extremely minutely and densely punctate. *Legs* finely punctate, rather short and robust; first joint of the posterior tarsi one-third longer than the second, slightly shorter than the fifth. Length 3.3 mm.

California; (Mt. Diablo, Contra Costa Co. 2).

The specimens are both females;⁶ the sixth segment is broadly angulate behind, the apex scarcely at all rounded, the sides of the angle being broadly and very feebly arcuate. The species is easily distinguished by its narrow head semicircularly rounded behind.

⁶.—In a male since obtained at Reno, Nevada, the fifth segment is deeply and roundly emarginate at apex, the lateral angles being slightly produced; the surface has a deep oval impression, becoming extinct near the base; the sixth segment is deeply sinuate at apex, the sinus fully twice as wide as deep, with the edges slightly reflexed; the surface impressed.

S. truncaticeps n. sp.—Slender; sides nearly parallel; black, posterior margins of the four basal abdominal segments paler; legs castaneous, paler toward tip; palpi and antennæ reddish-brown throughout; pubescence very fine, short, rather dense, pale fulvous in color, more conspicuous on the pronotum toward the apex; integuments shining. *Head* robust, rather depressed, very slightly longer than wide; sides parallel, feebly arcuate behind the eyes; base truncate and very feebly arcuate; angles rather broadly rounded; surface rather feebly convex, broadly impressed between the antennæ, very finely and densely punctate, the punctures deep and much sparser in the middle anteriorly, slightly sparser posteriorly; antennæ slightly shorter than the head and prothorax together; basal joint distinctly longer than the next two combined, second slightly more robust and a little shorter than the third, the latter much longer than the fourth, joints four to ten decreasing gradually in length, the latter slightly longer than wide. *Prothorax* distinctly narrower than the head, widest slightly in advance of the middle, but slightly more than one-third longer than wide; sides in the anterior third strongly convergent and distinctly sinuate to the nuchal emargination which is broadly and feebly sinuate, in the posterior two-thirds moderately convergent and distinctly arcuate to the base which is narrowly truncate in the middle; angles rather broadly rounded; apical angles very obtuse and very broadly rounded; disk very broadly and feebly convex, minutely and not very densely punctate, with a narrow impunctate median line, having also a very short median basal carina extending thence as a very fine, nearly obsolete stria nearly to the middle. *Elytra* at base one-fifth wider than the prothorax; sides nearly parallel and straight; together almost transversely truncate behind; disk rather feebly convex, impressed on the suture toward the scutellum, finely, evenly and not very densely punctate; punctures slightly finer exteriorly and apically; suture finely margined, margin very gradually finer toward base. *Abdomen* at base slightly narrower than the elytra; sides very feebly divergent and nearly straight; surface rather feebly convex, very minutely and densely punctate; basal segments transversely impressed at base, with the impressed areas much more coarsely and densely punctate; fifth segment much shorter than the two preceding together. *Legs* rather short and slender; first joint of the posterior tarsi scarcely one-fourth longer than the second, much shorter than the fifth. Length 4.0 mm.

California; (Anderson Val., Mendocino Co. 1).

Described from the female in which the sixth segment is broadly angulate, with the apex of the angulation scarcely at all rounded; sides forming the angle broadly and feebly incurvate.

This fine species is readily distinguished from the preceding by its form, size and sexual characters.

All the species of this genus which I have examined have the bases of the first three or four dorsal segments of the abdomen transversely impressed and densely and coarsely punctate. In the Orus group the impressions are simply finely reticulated or alutaceous and are entirely devoid of punctures.

S. brunnipes Lec.—(Tr. Am. Ent. Soc. VIII, p. 179).—This form is described as having “pale brown legs.” I have thus far seen no such species in California, the legs of all the Californian species here described being very dark.

SCOPÆODERA n. g.n.

The species composing this genus have a distinctly Stilioid outline and do not resemble Scopæus in outward form. In addition to the characters given before, we may mention the much longer legs and longer and more slender tarsi. Besides *nitidus* Lec. this genus will perhaps comprise several allied species described from South America by Dr. Sharp, and also those Central American species placed by this author in Scopæus under group 4, together with the Colombian *S. pulchellus* Erichs.

LEPTORUS n. gen.

The species assignable to this genus have a peculiar appearance and differ considerably from Scopæus. They are elongate, very slender, parallel, with oblong prothorax having the anterior angles more or less prominent, and the sides parallel or slightly convergent behind and nearly straight.

The genus is widely extended in its distribution throughout the eastern portion of the United States, extending through Mexico to Central America where it is represented by *filum*, *concolor*, *Salvini*, *obscurus*, *piceolus*, *brevipennis*, and *umbra*, recently described by Dr. Sharp in the Biologia Centrali-Americana. It will also include *exiguus* Er. and

picipes Cas. On the west coast it is replaced by *Orus*, having a much wider neck and a distinctly different system of punctuation; this appears to extend down the western slope of the continent, also to Central America, where it is represented by a species recently described by Dr. Sharp from Guatemala.

Leptorus is probably a large genus, and the several forms, which are often closely allied, should be described with great care and constant attention to details if they are to be even approximately identified by future reviewers.

In addition to the characters pointed out in the preceding table, it should be stated that the eyes are situated just before the middle, on the sides of the head; they are strongly, longitudinally oval, very coarsely granulated, and have on their upper edge in the middle a large, rather shallow, spongiose fovea bearing a single very long seta.

In *Orus* the eyes are larger, less coarsely granulated, more broadly oval, and have near the upper border, and in a transverse line with the posterior margin, a small, deep, setigerous puncture which is entirely nude. The puncture in this case, though very near the eye, is entirely disengaged from it, while in *Leptorus* the fovea, which is of an entirely different structure, intrudes slightly upon the continuity of the edge.

L. texanus n. sp.—Slender; sides parallel; moderately depressed; pale rufo-testaceous, elytra clouded with piceous toward base; abdomen piceous, very slightly paler toward tip; antennæ testaceous throughout; legs pale flavate; pubescence excessively fine and short, dense except on the pronotum where it is sparse; integuments alutaceous, except the pronotum which is polished. *Head* slightly longer than wide; sides parallel, very feebly arcuate behind the eyes; base transversely truncate; angles narrowly rounded; surface transversely and rather strongly convex, excessively minutely and densely punctate; punctures impressed, deep, slightly sparser along the middle; eyes rather prominent, at twice their length from the base; antennæ slightly shorter than the head and prothorax together, basal joint slightly longer than the next two combined, second slightly longer and more robust than the third, joints four to ten decreasing distinctly in length, the former

slightly longer than wide, the latter a little wider than long. *Prothorax* very slightly narrower than the head, one-third longer than wide, widest at one-fourth the length from the apex; sides thence extremely feebly convergent and nearly straight to the base, and very rapidly so and very feebly sinuate to the apex which is very narrow; anterior angles obtuse, slightly rounded; posterior rather broadly rounded; base broadly and very feebly arcuate; disk transversely and feebly convex, excessively minutely punctate; punctures about one-half as wide and more than twice as distant as those of the head, slightly more sparse in the middle, where there is a narrow impunctate line, and toward base a very fine, feeble and obsolete median stria. *Elytra* slightly wider than the prothorax; sides nearly parallel, feebly arcuate posteriorly; together broadly, angularly and very feebly emarginate behind; disk one-fourth longer than wide, slightly longer than the pronotum, very feebly impressed on the suture toward the base, extremely finely and rather feebly punctate; punctures evenly distributed, scarcely as sparse as those of the pronotum, distinctly asperate; suture finely margined with an elevated line which is much finer near the scutellum. *Abdomen* at base slightly narrower than the elytra and slightly narrower than at the apex of the fourth segment, rather strongly convex, excessively finely, densely and subasperately punctate; first four segments equal in length, the fifth one-half longer. *Legs* rather short and robust; joints of the posterior tarsi decreasing very gradually and uniformly in length, first slightly longer than the second and shorter than the fifth. Length 2.5 mm.

Texas; (El Paso 2).

The type is a male, the sixth ventral segment being narrowly and deeply emarginate; emargination very small, distinctly deeper than wide, sides nearly parallel and straight, bottom broadly rounded. In the female the sixth segment is broadly and feebly angulate, the apex being broadly rounded.

L. bicolor n. sp.—Slender; sides parallel; moderately convex; pale rufo-testaceous, four basal segments of abdomen piceous-black, last two slightly paler; elytra clouded with piceous at base near the scutellum; antennæ throughout and legs pale rufo-testaceous, the latter slightly more flavate; pubescence extremely short and fine, rather dense on the elytra and abdomen. *Head* slightly longer than wide; sides behind the eyes parallel and very feebly arcuate; base truncate; angles narrowly rounded; eyes moderate, slightly prominent, on the sides just before the middle; front transversely and evenly convex, minutely reticulate, extremely minutely and rather densely punctate; punctures more dense toward the eyes, less dense along the middle; antennæ one-half longer than the head, second joint slightly longer and more robust than the third, joints two to five longer than wide, six to ten shorter,

equal in length, the latter slightly transverse. *Prothorax* widest at one-fourth its length from the apex, where it is scarcely as wide as the head, one-fourth longer than wide; anterior angles very narrowly rounded, decidedly prominent; sides thence strongly convergent and feebly sinuate to the neck, which is not excessively narrow, and distinctly convergent and very feebly arcuate to the base which is transversely truncate in the middle, two-thirds as wide as the disk; angles somewhat narrowly rounded; disk transversely and feebly convex, very minutely reticulate or subrugulose; excessively, minutely punctate; punctures finer and more sparse than those of the head, with a very narrow indistinct median impunctate line, and, toward base a very feeble median carina which is finely striate along its crest. *Elytra* at base very slightly wider than the pronotum; sides nearly parallel, feebly arcuate; together very feebly and broadly emarginate behind; disk distinctly longer than wide, one-fifth longer than the prothorax; feebly convex, broadly and feebly impressed along the suture, extremely minutely, evenly and rather densely punctate. *Abdomen* very slightly narrower toward base, feebly convex, very minutely and densely punctate. Anterior femora nearly twice as robust as the intermediate, abruptly and deeply sinuate on the inner edge near the apex; tarsi very feebly dilated, finely and densely pubescent beneath. Length 2.3 mm.

Texas; (Austin 5).

The anterior tibiae of the male exhibit very striking characters; they are distinctly dilated and have along the flattened interior face six parallel, oblique rows of short, inclined setae, the rows becoming shorter toward the apex. The four posterior femora are distinctly compressed and arcuately bent. The male has the sixth segment broadly sinuate at apex, the sinus being four or five times as wide as deep and rather narrowly rounded, the sides being very gradually recurved; from beneath the sinuation, and apparently attached to the seventh segment, there protrudes a robust ligula, slightly longer than wide, strongly convex on its lower face, abruptly constricted at base, squarely truncate at apex, with the angles not rounded; the upper face is broadly concave, serving as a rest and guide for the male generative organ; the latter in the present species is very complex, being cylindrical, with two unequal lateral processes, angulate on the right and broadly rounded on the left.

The peculiarity of the anterior tibiæ is apparently generic, or at least affects a large number of species.

L. versicolor n. sp.—Very slender; sides parallel; colors and pubescence as in *bicolor*, except that the abdomen is dark fuscous and slightly paler at apex. *Head* rather large; distinctly longer than wide; sides behind the eyes feebly but distinctly divergent and feebly arcuate to the base which is broadly and distinctly sinuate; angles rather prominent and narrowly rounded; front broadly and feebly convex, not reticulate, shining, very minutely, evenly and rather densely punctate; punctures separated by two or three times their own diameter; antennæ one-half longer than the head, second joint much longer and more robust than the third, fifth very slightly longer than wide, tenth very slightly wider than long. *Prothorax* widest at one-fourth its length from the apex, distinctly narrower than the head; anterior angles narrowly rounded, prominent; sides thence strongly convergent and distinctly sinuate to the neck which is very slender, and distinctly convergent and nearly straight to the base which is transversely truncate and three-fourths as wide as the disk; angles somewhat narrowly rounded; disk one-third longer than wide, feebly convex, very minutely, evenly punctate, scarcely visibly subrugulose; punctures scarcely perceptibly more sparsely distributed than those of the head; median stria toward base nearly obliterated. *Elytra* at base scarcely perceptibly wider than the prothorax; sides distinctly divergent and very feebly arcuate; disk very feebly convex, very feebly impressed along the suture toward base, minutely and feebly subrugulose, finely, evenly, rather densely and subasperately punctate; slightly longer than wide and just visibly longer than the pronotum. *Abdomen* nearly as in *bicolor*, slightly more sparsely punctate. Length 2.1–2.5 mm.

Texas; (Austin and Waco).

The sixth segment in the male is broadly sinuate at apex, the sinus being slightly less than four times as wide as deep, rather acutely rounded; ligula long and narrow, perfectly flat, gradually wider toward the apex which is broadly and extremely feebly sinuate, angles rounded.

The anterior femora and tibiæ are as in *bicolor*, but the former are not so robust as in that species. The form of the head and the sexual characters will serve to distinguish this species from the preceding, to which it is otherwise closely allied.

L. longiceps n. sp.—Very slender, rather convex; sides parallel; head and elytra pale brownish-testaceous; prothorax paler, more flavate; abdomen dark fuscous, scarcely paler at apex; antennæ and legs throughout pale rufo-

testaceous; pubescence fine and dense throughout, longer on the head, less conspicuous on the pronotum. *Head* much longer than wide; sides parallel and distinctly arcuate; base transversely truncate; angles not prominent though rather narrowly rounded; front transversely, rather strongly convex, extremely minutely, feebly, evenly and not densely punctate; eyes at much more than twice their length from the base; antennæ short, scarcely longer than the head, rather robust, second joint very slightly longer than wide, slightly longer and much more robust than the third, tenth rather strongly transverse. *Prothorax* very slightly narrower than the head, widest at one-third its length from the apex; anterior angles very broadly rounded; sides almost parallel and distinctly arcuate; base transversely truncate, angles rather broadly rounded; disk nearly one-third longer than wide, moderately and evenly, cylindrically convex, very minutely, evenly and rather densely punctate; punctures appreciably closer than those of the head; throughout the basal three-fifths there is a fine, well-marked, median stria. *Elytra* at base distinctly wider than the prothorax and fully as wide as the head; sides parallel and very feebly arcuate; together distinctly longer than wide and just visibly longer than the pronotum; surface rather feebly convex, rather narrowly and feebly impressed along the suture toward base, very minutely, evenly and densely punctate; punctures slightly coarser and just appreciably more dense than those of the pronotum. *Abdomen* very slightly narrowed toward base, excessively minutely, feebly and rather densely punctate. Femora and tibiae as in *bicolor*. Length 1.9 mm.

Texas; (Austin 1).

This species is aberrant not only in the more broadly rounded apical angles of the prothorax, the elongate head and shorter antennæ, but in the smaller eyes, more compressed and truncate third maxillary palpal joint, and especially in the position of the spongiose setigerous fovea, which is not at the middle of the upper margin of the eye as in the other species, but behind the eye one-half the length of the latter, and in a line with its upper margin. The neck also is relatively much less slender than in the other species. With exception of *Leptogenius brevicornis* it is the smallest Pæderide described from our territories. Unfortunately there is before me but a single representative, a female, so that the sexual characters of the male cannot be given; the form is very distinct, however, and will be easily recognizable.

The Central American species described by Dr. Sharp,

alluded to above, are apparently all distinct from those here brought to notice. *Filum* differs in the coloration of the antennæ and in the sexual characters; *concolor* decidedly in coloration of the entire body; the œdeagus, however, is apparently similar to that of *bicolor*; *Salvini* appears to be closely allied to *versicolor*, but as no ligula is described in alluding to the male sexual characters,⁷ and as the elytra appear from the figure to be longer and broader, and the apical angles of the prothorax much less pronounced, the two species are probably distinct, more especially in consideration of the very different faunal regions involved. *Obscurus* and *piceolus* are very distinct in color; *brevipennis* and *umbra* differ altogether in structure. *Exiguus* Er. differs radically in coloration.

Color appears to be a very constant character, as it is practically the same throughout large series of several species which I have before me.

ORUS Cas.

This genus, and the closely related *Leptorus*, constitute a group differing remarkably from *Scopæus* and *Scopæodera* in the structure of the intercoxal portion of the prosternum. In *Orus* the posterior edge of the prosternum is more swollen than in *Leptorus*, and the median portion is, posteriorly, elevated into a longitudinal ridge which becomes the lower edge of the intercoxal lamina. *O. punctatus* Cas. and the species here described are the only known representatives of this genus in the United States.⁸

⁷.—The ligula is present in all the species of this genus, but, probably only before copulation, is securely held within the long angular cleft of the seventh segment, and is only pushed down and out of the cleft, so as to be plainly visible, after sexual connection has occurred.

⁸.—By a very regrettable error it was stated by me (Bull. Cal. Acad. Sci. I, p. 315) that the ligula in *Orus* is bicuspid. One of the very minute teeth was in all probability hidden under a particle of dust, as the appearance in the specimen examined was undoubtedly that of a bicuspid ligula;

O. parallelus n. sp.—Narrow, rather depressed; sides parallel; piceous-black throughout; legs rufo-piceous; tarsi and antennæ throughout paler, rufo-fuscons; pubescence fine, rather sparse on the pronotum and elytra, denser and more conspicuous on the head and abdomen; integuments polished, head subalutaceous. *Head* very slightly longer than wide; sides distinctly convergent anteriorly from the base, distinctly arcuate behind the eyes; base broadly and extremely feebly arcuate; angles broadly rounded; surface broadly and feebly convex, very feebly impressed in the middle anteriorly, very minutely and densely punctate, also extremely finely and rather feebly subrugulose; punctures not sparser but rather coarser along the middle; antennæ slightly shorter than the head and prothorax together; basal joint slightly longer than the next two together, joints two to four subequal in length, slightly elongate, fifth very slightly shorter, joints five to ten decreasing rapidly in length, the former distinctly longer than wide, the latter very slightly wider than long. *Prothorax* very slightly narrower than the head, oblong; sides extremely feebly convergent from apex to base and nearly straight; anterior angles obtuse and broadly rounded; sides thence very strongly convergent to the nuchal emargination which is two-fifths as wide as the disk and feebly incurvate; basal angles broadly rounded; disk transversely and feebly convex, two-fifths longer than wide, rather finely, feebly and densely punctate; very narrow median area impunctate throughout the length. *Elytra* at base slightly wider than the pronotum; sides very feebly divergent, feebly arcuate toward the apex; together broadly, angularly and very feebly emarginate behind; disk slightly longer than wide and slightly longer than the pronotum, feebly convex, broadly and feebly impressed on the suture, more particularly near the base, finely, rather densely, evenly and subasperately punctate; suture finely margined with an elevated border which becomes rather abruptly less than one-half as wide near the scutellum, where also it is not so strongly elevated. *Abdomen* at base slightly narrower than the elytra; sides very feebly divergent posteriorly; surface broadly convex, extremely minutely and densely

subsequent observation, however, of cleaner and more perfect specimens, reveals the fact that the ligula is tricuspid, hence the statements made upon the apparent relationship of the genus with *Lithocharis* (l. c. II, p. 36), which were based primarily upon the assumption of a bidentate ligula must be considered ill-founded. The wide departure of the genus from *Scopæus* in general form, but particularly in the relatively wide neck and prosternal structure, is very convincing proof that the time has come for a division of the Scopæoid species into distinct generic groups, and also points strongly to the advisability of a division of the Pæderini into two sections depending upon the formation of the ligula.

Although Dr. Sharp has, in the *Biologia Centrali-Americana*, correctly placed the genus near *Scopæus* since the above was originally written, I still deem it proper to publish the rectification in the same work in which the error was committed.

punctate; fifth segment two-thirds longer than the fourth. *Legs* rather short; posterior tarsi short, first and second joints equal in length, slightly longer than wide, much shorter than the fifth; tibiae obliquely truncate and finely fimbriate at tip. Length 3.3 mm.

California; (Napa and Sonoma Cos. 4).

The specimens are all females, the sixth segment being broadly rounded behind. The present species is remarkable for its long parallel prothorax, which is scarcely at all produced in front of the apical angles. It may be distinguished from *punctatus* by its slightly larger size and much finer and denser pronotal punctuation.

The oblique apical truncation of the hind tibiae appears to characterize a large number of genera; the truncation is slightly excavated and bordered exteriorly by an erect line of long, slender, closely-placed setae.

The tabular statement of our *Pæderini* given in this Bulletin (Vol. II., p. 38), requires modification since the publication of the Central American genera by Dr. Sharp in the *Biologia Centrali-Americana*, and as the assumption upon which the positions of one or two genera are assigned has been found to be erroneous, the following table is offered as a substitute until the entire group can be revised. This scheme would be much more useful if it could have included all the American genera, but as in the present state of literature there would be considerable doubt regarding the position of several, I have thought best to restrict it for the present to the genera occurring north of Mexico.

I—*Ligula* not tricuspid, usually bilobed.

Prosternum membranous under and behind the coxae.

PÆDERI.

A—Fourth tarsal joint normal, not bilobed.

Antennæ anteriorly geniculate, first joint greatly elongate.

Neck broad; abdomen carinate at base.....**Hesperobium.**

Neck narrow; abdomen not carinate.....**Ababactus.**

Antennæ posteriorly geniculate, basal joint moderate in length.

First joint of the posterior tarsi not longer than the second.

- Labrum bilobed.....**Lathrobium.**
 Labrum transversely truncate.....**Trachysectus.**
 First joint of the posterior tarsi distinctly longer than the second.
 Neck rather wide, not less than one-third as wide as the prothorax.
 Anterior tarsi very slightly or not at all dilated.
 Labrum 4-dentate.
 Metasternum very long.....**Caloderma.**
 Metasternum very short.....**Oligopterus.**
 Labrum bidentate.....**Medon.**
 Labrum unidentate.....**Lithocharis.**
 Labrum unarmed.
 Deeply emarginate.....**Dacnochilus.**
 Broadly and rather feebly sinuate.....**Lena.**
 Labrum entire.
 Elytra much shorter than the prothorax.....**Liparocephalus.**
 Anterior tarsi strongly dilated.
 Labrum unidentate.....**Aderocharis.**
 Labrum entire, truncate.....**Ramona.**
 Neck extremely slender; labrum bidentate.....**Stilicus.**

B—Fourth tarsal joint bilobed.

- Labrum triangularly emarginate, unarmed.....**Pæderus.**

Prosternum corneous under and behind the coxæ; the side pieces of the pronotum connate with the intercoxal process.

SUNII.

- Third joint of the maxillary palpi normal; fourth minute, subulate.
 Posterior tarsi with the fourth joint lobed beneath.
 Labrum bidentate.....**Sunius.**
 Labrum large, rounded, ciliate; elytra shorter than the prothorax,
 Stilicopsis.
 Third joint of maxillary palpi securiform; fourth minute, not subulate,
 triangular, erect.
 Fourth joint of the posterior tarsi not lobed, normal.....**Leptogenius.**

II.—*Ligula tricuspid.*

- Prosternal intercoxal lamina deeply emarginate anteriorly; neck extremely slender.
 Inflexed posterior portion of pronotal hypomera well developed.
 Scopæus.
 Inflexed portion rudimentary.....**Scopæodera.**
 Prosternal intercoxal lamina inferiorly arcuate anteriorly.
 Neck extremely slender.....**Leptorus.**
 Neck one-third as wide as the prothorax.....**Orus.**

The sequence of genera in the above tabular statement is, it must be confessed, unnatural in approximating *Stilicus* and *Pæderus*, these being undoubtedly widely divergent forms. It merely serves to show, however, that it is impossible to present in a linear arrangement, groups composed of elements which are divergent from one or more central types, and which can only be represented graphically by the diagrams adopted in chemical science to exhibit the structure of a compound molecule, the various affinities being shown by connecting lines.

If a linear arrangement be pursued, based upon the modification of any special organ or part of the body, similar breaks must inevitably occur. Assuming, as above, that the structure of the prosternum is of more importance than that of the tarsi, the latter being in turn of greater moment than that of the labrum or mandibles, we should isolate *Pæderus* as a group intermediate between the *Lathrobii* and the *Sunii*, and it would not be consistent to separate them by the the latter group, although it may include forms which in a radial arrangement would be brought very near certain types of the *Lathrobii*. Such for instance are *Stilicus* and *Echiaster*, in distinguishing between which the prosternal character loses some of the importance which it is supposed to possess, unless we regard the similarity of habitus as a mere coincidence. The latter I have assumed in the case of *Stilicus* and *Scopæus*.

NOTES.

ABABACTUS Sharp. — This genus is represented in our fauna by *A. nactus* Horn. and *A. pallidiceps* Cas.

TRACHYSECTUS Cas.—Represented by *T. confluent* Say.

CALODERMA Cas.—Recent investigation shows this genus to be similar in prosternal structure to *Medon*, from which it is distinguished by several important characters. The labrum is short, small, conical, very feebly explanate near

the sides, triemarginate, the notches being similar in shape, deep, the middle about twice as large as the lateral; laterally the apex is broadly sinuate, thus giving four small, acute, prominent denticles. In *Medon*, as represented by *M. fuscus* Mann., the labrum is much larger, nearly flat, broadly explanate at the sides, not at all sinuate laterally at the apex, so that it is at most bidentate.

In comparing the European *Medon*, as for instance *brunneus* Er., with many of the American genera, there is one feature relating to the metasternum which appears to have been generally overlooked, and which is indicated on the upper surface by the length of the elytra. The metasternum in the European genus is remarkably short, strongly convex, and much shorter than the intermediate coxæ. This appears to be a rather important character in the present comparison, and distinguishes *Caloderma* at once, for in this genus the metasternum is unusually well developed, and is more than one-half longer than the coxæ, which in turn are relatively distinctly smaller than in *Medon*.

The species having a rugulose pronotum are the most highly developed forms of the genus, and should be considered typical, although much less numerous in species than the form with punctate pronotum.

OLIGOPTERUS Cas.—Allied to *Medon* in prosternal and metasternal structure. It differs from *Medon* in the structure of the labrum, which is here distinctly 4-dentate, and from the more typical forms of that genus in the very widely distant gular sutures, rapidly divergent toward base, in this respect being more closely allied to *Pseudomedon* Rey. It differs from *Caloderma* in its very short metasternum.

MEDON Steph.—This genus as represented in our fauna will consist for the present of the two groups of species previously placed by me in *Lithocharis*. There is another group of nondescript species, occurring in the Southern

States, which may also be considered as *Medon* until future investigation can be made with more ample material. These three groups will then probably give rise to four allied genera, or perhaps more properly, subgenera.

LITHOCHARIS Lacord.—Represented in our fauna by *ochracea* Grav., *alutacea* Cas., and *quadricollis* Cas. The last two differ from the first in sexual characters—although they have the characteristic comb-like sculpture at the apex of the fifth segment—and in the smaller, more acute and prominent labral tooth.

METAXYODONTA Cas.=**LITHOCHARIS** Lacord.

LIPAROCEPHALUS Mann.—No description of the anterior tarsi is given, and the position of the genus is assumed.

ADEROCHARIS Sharp.—Represented by *A. corticina* Grav., and possibly also by *tabacina* Cas.

ECHIASTER Er.—No species of this genus has yet occurred within the United States, and it is therefore omitted from the table.

SCIOCHARIS Arrib.—Although Dr. Sharp intimates that this genus may occur within our limits, I have not yet seen it. It may be easily recognized by the very robust first and second joints of the antennæ. The labrum is bidentate and the integuments are generally very finely and densely punctate.

APOCELLUS Erichs.

A. niger n. sp.—Moderately robust, convex; upper surface intense black throughout, except the elytral suture which is dark piceo-testaceous; metasternum, abdomen and head beneath black; prosternum and side-pieces paler, piceo-testaceous; antennæ same toward base, black toward tip; legs pale luteo-testaceous, femora shaded piceous in the outer half; pubescence extremely sparse; integuments highly polished. *Head* distinctly longer than wide; sides behind the eyes distinctly convergent and rather strongly arcuate; base truncate and very feebly incurvate in the middle; angles very broadly rounded, coarctate with the sides; eyes small, in the middle, rather prominent; on a transverse line slightly less than their own length behind them,

there are two small, widely distant, deeply impressed occipital foveæ; antennal tuberculations slightly convergent posteriorly; epistoma distinct, declivous, wider than long, very feebly arcuate at apex; labrum short, broad, rather strongly and evenly emarginate throughout its width; antennæ slightly longer than the head and prothorax together, rather strongly incrassate; second joint much shorter than the third, longer than the fourth, tenth very slightly wider than long. *Prothorax* widest at one-third its length from the apex, where it is slightly wider than long and as wide as the head across the eyes; sides thence very strongly convergent to the apex which is squarely truncate and about one-half as wide as the disk, and rather feebly though distinctly convergent, evenly and distinctly arcuate to the base; the latter broadly and extremely feebly arcuate, two-thirds as wide as the disk; angles very obtuse and rather broadly rounded; sides at the apical third rather broadly rounded; disk strongly convex, with a few very widely scattered setigerous punctures. *Elytra* at base slightly wider than the prothorax; sides rather strongly divergent, distinctly arcuate toward the apices; together transversely truncate behind; disk rather depressed, abruptly strongly declivous at the sides, slightly wider than long, nearly one-fourth longer than the pronotum; suture narrowly and strongly margined with an elevated line; surface having a few very small, widely scattered, setigerous punctures having a tendency to lineal arrangement. *Abdomen* at base very slightly narrower than the elytra; sides parallel and nearly straight; border very thin, erect and deep, nearly equal on the five basal segments; surface very finely and sparsely pubescent and punctate toward the sides, almost impunctate in the middle. *Legs* moderate in length; femora robust; third joint of the posterior tarsi less than twice as long as the first and second together. Length 2.8-3.3 mm.

Texas; (Galveston 5).

The description is taken from the male, the sexual characters of which are of the usual form in this section of the genus; the double, posteriorly excavated emargination of the sixth segment is scarcely more than one-third the width of the segment, and the arched laminae of the seventh nearly meet over the broadly rounded excavation; eighth segment broadly impressed. It is a very distinct species and belongs immediately after *crassicornis* in the list of the genus as published by me (Cont. II, p. 153). The order of the species has been changed in the recently published check-list of Mr. S. Henshaw, so that the least characteristic forms of the genus there head the list, while the species upon which Erichson founded the genus appear last. My only commentary is a passing allusion; I cannot refrain, however, from

expressing the opinion that the reversal was unnecessary, and that the order proposed is far less scientific than that published in the revision above referred to.

Apocellus brevipennis Cas.—Five specimens of this species were recently taken, also at Galveston, Texas; it was originally described from a single specimen from Louisiana.

PHLEOPTERUS Mots.

P. flicornis n. sp.—Rather robust, depressed, black throughout; trochanters slightly paler, dark rufous; legs piceous-black; tibiae much paler and rufous toward tip; tarsi rufous; palpi fuscous; antennæ black throughout; pubescence rather long, very dense, subrecumbent and conspicuous, fusco-cinereous in color; legs densely pubescent; tibiae abruptly nearly glabrous in the apical fifth or sixth; tarsi glabrous, joints finely spinulose at the apices; shining. *Head* as long as wide, depressed, transversely and rather strongly impressed between the antennæ, deeply and widely biimpressed between the eyes; surface finely and rather densely punctate; ocelli very minute, round, distant, on a line slightly in advance of the posterior margins of the eyes; the latter very prominent; fourth joint of the maxillary palpi slightly more than twice as long as the third, the latter not three times as long as wide; antennæ very long, slender and filiform, not in the least incrassate, two-thirds as long as the body; second joint much shorter than the third, joints three to ten subequal in length, much elongated, eleventh slightly longer, fusiform. *Prothorax* widest slightly before the middle; sides thence very feebly convergent, feebly and evenly arcuate to the obtuse and rather broadly rounded anterior angles and somewhat strongly convergent, rather strongly and evenly incurvate throughout to the basal angles, which are nearly right and not at all rounded; base broadly and extremely feebly arcuate throughout, three-fourths as wide as the disk and distinctly narrower than the apex; the latter transversely truncate, feebly excurvate toward the apical angles; disk scarcely one-third wider than long, transversely, rather strongly and perfectly evenly convex; having at the middle of each side, a very deep punctiform impression; flanks thence to the basal angles very abruptly and strongly declivous; surface very finely, evenly and densely punctate; punctures perforate. *Elytra* at base slightly wider than the pronotum; sides moderately divergent; humeral and apical angles very broadly rounded; together broadly arcuate behind with the inner angles abruptly and rather strongly rounded; disk nearly one-third longer than wide, slightly more than twice as long as the pronotum, broadly and feebly convex, rather coarsely, very evenly and densely punctate; punctures impressed, slightly more distant than those of the pronotum. *Abdomen* very short behind the elytra, much wider than long, subalutaceous, very minutely, evenly and rather closely punctate. *Legs* rather slender; first joint of the posterior

tarsi slightly longer than the next two together; anterior tarsi distinctly dilated. Under surface of the abdomen minutely, densely and evenly punctate. Length 5.0 mm.

California; (Placer Co. 1). Mr. Fuchs.

The mesosternum is minutely and strongly rugulose and alutaceous toward the middle, finely and imperfectly carinate posteriorly, more strongly so anteriorly, terminating near the anterior margin in a small, abrupt, acute tubercle. The abrupt loss of the dense pubescence at the tips of the tibiae is very remarkable.

This species is rather smaller and much more densely punctate than *longipalpus*, and has a much less transverse prothorax.

AMPHICHROUM Kraatz.

A. flavicorne n. sp.—Moderately robust, depressed; pronotum and elytra glabrous; abdomen very sparsely pubescent laterally; male black, with the lateral edges of the pronotum and elytra testaceous; female having the entire disk of the pronotum rufo-testaceous and the elytra luteous, except the suture, which is piceous; antennae pale flavate throughout; legs piceo-testaceous; integuments polished. *Head* scarcely longer than wide, depressed, densely, rather coarsely and deeply punctate in the middle; having a small, punctiform impression at the base of each antenna; obliquely and very deeply bifoveolate between the eyes; antennae moderate in length, less than one-half as long as the body, rather slender; basal joint three-fourths as long as the next two together, second two-thirds as long as the third and about as long as the tenth, joints three to ten decreasing perceptibly in length and increasing in thickness. *Prothorax* two-thirds wider than long, widest in the middle; sides strongly and nearly evenly rounded, slightly more strongly convergent toward the apex, which is broadly and very feebly emarginate and equal in width to the base and to the head; base truncate; apical and basal angles broadly rounded, the former slightly the more narrowly so; disk moderately and evenly convex, more strongly so at the sides, which are narrowly and abruptly explanate, extremely sparsely, rather finely and very unevenly punctate except along the sides and base, where the punctures are much denser. *Elytra* at base very slightly wider than the prothorax; sides very feebly divergent and nearly straight; together truncate behind; humeral and exterior apical angles broadly rounded; disk as long as wide, slightly less than twice as long as the prothorax, depressed, more convex at the sides, narrowly elevated along the suture except near the base, feebly, rather sparsely and unevenly punctate. *Abdomen* as wide and long as the elytra; sides strongly arcuate; surface shining, extremely finely and feebly punctate,

very minutely, feebly and transversely reticulate. *Legs* moderate in length; anterior tarsi feebly dilated. Length 3.5-4.0 mm.

California; (San Francisco 2; Lake Co. 2.) Mr. Fuchs.

The pronotum has a very small impressed fovea in the middle at the base which is sometimes absent and sometimes replaced by a larger and more irregular impression which, however, is not transverse as in *floribundum*.

This species resembles *floribundum* Lec. in several characters, especially in the punctate head and coloration of the body, but differs remarkably in the antennæ, which are of a pale and pure flavate throughout in the former; the antennæ are piceous in *floribundum* except the three basal joints, which are paler.

In all the species of *Amphichroum* here described, there are visible on the first, or sometimes the second, exposed dorsal segment of the abdomen two small, approximate patches of a more or less transversely oval shape, on which the pubescence is excessively short and dense and usually of a pale cinereous or bright fulvous color; they are also to be seen in a similar position, but oblique in direction, on the abdomen of *Homalium algarum* Cas. These pubescent and very minutely rugulose areas, which are probably sensitive, are not sexual, and appear to characterize a large portion of the Homalini.

A. alutaceum n. sp.—Form rather slender, depressed; head and abdomen black; pronotum, elytra, palpi and antennæ toward tip rather pale castaneous; basal margin and sides of the pronotum very narrowly pale flavate; antennæ same toward base; elytral suture dark rufo-testaceous; legs dark brownish-testaceous; pronotum and elytra rather densely pubescent; head and abdomen very sparsely so; integuments shining. *Head* longer than wide; surface depressed, impunctate, coarsely granulose, shining, broadly and distinctly impressed between the antennæ, obliquely, very finely and feebly bistrate between the eyes; ocelli small, approximate, distinct; antennæ scarcely two-fifths as long as the body, slender, slightly incrassate; basal joint very slightly longer than the second; joints two to ten nearly equal in length, the latter one-half longer than wide, eleventh longer, obliquely pointed at tip, cylindrical at base. *Prothorax* widest in the middle, where it is scarcely one-fourth wider than long; sides nearly parallel, feebly arcuate

throughout; apex very slightly narrower than the base, broadly and evenly sinuate; angles rather narrowly rounded; base very feebly arcuate throughout, angles rather broadly rounded; disk broadly, very evenly and rather feebly convex, very narrowly and abruptly explanate at the sides anteriorly, slightly more broadly and less abruptly so posteriorly, extremely finely, evenly and rather closely punctate; punctures slightly asperate; intervals finely subgranulose, subalutaceous. *Elytra* at base very slightly wider than the pronotum; sides rather distinctly but very feebly divergent, very feebly arcuate; humeral angles narrowly, apical broadly, rounded; together truncate behind; disk depressed, broadly impressed in the middle; as long as wide, slightly less than one-half longer than the pronotum, rather coarsely, very evenly, closely and rather strongly punctate; punctures subasperate; intervals polished. *Abdomen* at base as wide as the elytra, at the apex of the third segment nearly one-fourth wider; sides strongly arcuate; border rather broad, feebly inclined; surface depressed; three visible basal segments transversely impressed at base; segments two to four finely, evenly and rather densely punctate; segments one, five and six impunctate; second visible segment with two small, transverse, approximate, minutely rugulose and apparently pubescent patches. *Legs* moderate in length, slender. Under surface piceous-black, with exception of the pronotal and elytral hypomera, which are flavate. Length 3.5 mm.

California; (Marin Co. 1).

This species resembles *veterator* in the general character of its sculpture and pubescence, but differs greatly in general form, and especially in its much less transverse prothorax with but slightly arcuate sides.

A. pilosellum n. sp.—Males slender; females rather robust, depressed; color rather pale reddish-testaceous, nearly similar in the two sexes; head posteriorly, prothorax anteriorly, and elytra broadly and very indefinitely toward the suture and apices, clouded with a slightly darker castaneous tint; abdomen intense black throughout; antennæ fuscous toward tip, basal joints pale testaceous; legs rufo-piceous; pronotum and elytra finely and sparsely pubescent, integuments shining. *Head* very slightly longer than wide, rather depressed, glabrous, finely reticulate or subalutaceous, impunctate, broadly and rather feebly impressed between the antennæ, feebly, finely and obliquely bistrate between the eyes; antennæ rather short, moderately incrassate, less than one-half as long as the body; basal joint but slightly longer than the third, second nearly as long as the first, as long as the fourth, and slightly longer than the tenth, joints four to eight equal in length, eight to ten decreasing, the latter but slightly longer than wide. *Prothorax* widest in the middle, one-half wider than long; sides strongly rounded in the middle, feebly convergent and nearly straight anteriorly and

posteriorly; basal angles broadly rounded; apical more narrowly so; disk evenly and moderately convex, rather broadly and gradually explanate and feebly reflexed at the sides, and especially near the basal angles, very obsoletely impressed along the middle and in front of the scutellum, finely reticulate or subalutaceous, very finely, feebly and rather sparsely and evenly punctate. *Elytra* at base very slightly narrower than the prothorax; sides very feebly divergent, feebly arcuate; disk depressed, very slightly longer than wide, two-thirds longer than the pronotum, rather strongly, coarsely and sparsely punctate; intervals polished; punctures tending to form coarse, transverse rugulae. *Abdomen* as wide as and distinctly longer than the elytra; sides rather feebly convergent posteriorly, on the first four segments feebly arcuate; border depressed, scarcely at all inclined; surface polished, nearly impunctate in the middle, excessively minutely and feebly punctulate toward the sides. *Legs* slender; anterior tarsi very feebly dilated; first joint of the posterior as long as the next three together. Length 2.5-3.6 mm.

California; (Lake Co. 7). Mr. Fuchs.

Described from the male, which is more slender than the female. The species belongs near *puberulum* Fauv., but differs in its longer elytra and much sparser elytral punctation.

A. veterator n. sp.—Moderately robust, depressed, dark piceous-brown; antennae toward base, narrow side and basal margins of the pronotum, and under surface of the head and prothorax, pale testaceous; abdomen black throughout; femora piceo-testaceous; tibiae and tarsi darker, piceous; antennae infusate toward tip; palpi fuscous; head and pronotum subalutaceous; pronotum and elytra finely and densely pubescent, the latter shining. *Head* rather small, scarcely as wide as long, transversely and feebly impressed between the antennae, very finely, feebly and obliquely bistrate between the eyes; surface rather coarsely and strongly reticulate or subgranulate, impunctate; ocelli very small, round and distinct; antennae about one-half as long as the body, moderately slender, all the joints distinctly elongate, joints four to ten almost equal in length, the latter nearly one-half longer than wide, second distinctly shorter than the third, the latter subequal in length to the first. *Prothorax* anteriorly as wide as the head, widest in the middle; sides very slightly more strongly convergent anteriorly than posteriorly, evenly and rather feebly arcuate throughout; apex distinctly narrower than the base, broadly and feebly sinuate; the latter truncate in the middle, broadly arcuate toward the basal angles which are broadly rounded; apical broadly rounded, slightly less so than the basal; disk nearly one-half wider than long, evenly and very moderately convex, rather abruptly and very narrowly explanate at the sides anteriorly, broadly and very gradually explanate and feebly reflexed toward the basal angles, very obsoletely and vaguely impressed before the scutellum, finely and very feebly subgranulate, very minutely, feebly, subas-

perately, evenly and rather closely punctate. *Elytra* at base scarcely as wide as the pronotum; sides very feebly divergent, very feebly arcuate; outer apical angles rather narrowly rounded; together truncate behind; disk depressed, quadrate, two-thirds longer than the pronotum, rather coarsely, very densely, evenly, strongly and subasperately punctate. *Abdomen* as wide as and slightly longer than the elytra; sides convergent and evenly arcuate to the apex; border rather strong, very slightly inclined; surface polished almost impunctate in the middle, finely rather strongly and densely, subasperately punctate laterally. *Legs* rather slender. Under surface finely, evenly and sparsely pubescent; tibiae finely pubescent, sparsely and minutely spinulose. Length 3.0 mm.

California; (Lake Co. 2). Mr. Fuchs.

This species also belongs near *puberulum*, from which it is easily distinguished by its much longer elytra. It bears a very deceptive resemblance to the following species, so that the identification and separation of the two will require some care.

A. crassicornis n. sp.—Moderately robust, depressed, piceous-black; head dark rufous; basal third of the pronotum and the lateral and anterior margins very narrowly pale testaceous; just behind the elytral humeri there is on each side a small, very indefinite paler spot; under surface of the abdomen and metasternum piceous-black; prosternum, head, legs throughout, palpi and antennae toward base, pale brownish-flavate; antennae toward tip piceous; head and pronotum sublutaceous; elytra polished; head glabrous, remainder finely and moderately densely pubescent. *Head* rather small, finely reticulate and subrugulose, transversely impressed between the antennae, finely, deeply and obliquely bistriate between the eyes; ocelli large, flat, not distinctly limited, round; antennae rather strongly incrassate, scarcely one-half as long as the body; joints four to ten decreasing very slightly in length, the latter slightly longer than wide. *Prothorax* scarcely more than one-third wider than long; anterior angles much more narrowly rounded than the posterior; form and sculpture nearly as in *veterator*; punctures slightly coarser and more distinct. *Elytra* at base fully as wide as the pronotum; outer apical angles rather broadly rounded; together quadrate, two-thirds longer than the pronotum, nearly as in *veterator*, except that the punctures are obliterated along the apex. *Abdomen* in form nearly as in *veterator*, punctate throughout; punctures fine, asperate, evenly and rather closely placed, and more distinct toward the sides. *Legs* slender. Length 3.3 mm.

California; (Siskiyou Co. 1). Mr. Behrens.

The fourth joint of the maxillary palpi is nearly circular in cross-sections and convex throughout, while in all the

other species which I have seen the fourth joint is more or less deeply excavate interiorly, nearly throughout its length and is, in addition, strongly bent in *flavicornæ*.

Although the present species bears a remarkably strong resemblance to *veterator* in its sculpture, it may be distinguished by its sparser pubescence, slightly more elongate prothorax, much deeper interocular striæ, but especially by the form of the ocelli, which in this species are fully twice as wide as in *veterator*, and more indefinite in outline; no dependence is placed on color as this is known to vary greatly; it is, however, strikingly different in the representatives of the two species.

A. floribundum Lec.—One specimen which I have referred to this species was collected by Mr. Fuchs in Lake Co. The antennæ are relatively longer and more filiform than in any here described, and are piceous except the first three joints and the bases of some of the succeeding ones.

The relationship of the species here described with those given by Mr. Fauvel (Not. Ent. vii, p. 72), is best shown by the following table, which is merely a continuation of the one given by that author, with a few slight alterations.

Elytra shining, with more or less distinct punctuation.

Pronotum and elytra glabrous.

Pronotum polished.

Elytra with very sparse, nearly obsolete punctuation.....*sparsum*.

Elytra coarsely and generally distinctly punctate.

Head distinctly and densely punctate; elytra black or maculate with testaceous, with the suture blackish or brownish.

Antennæ piceous, three basal joints paler.....*floribundum*.

Antennæ clear flavate throughout....*flavicornæ*.

Head impunctate.

Head shining, with two oblique striæ between the eyes..*scutatum*.

Head dull, granulose, strongly bifoveolate between the eyes.

lævicolle.

Head and pronotum alutaceous, size large.....*testaceum*.

Pronotum and elytra visibly pubescent or pilose.

Size large; pronotum and elytra very strongly and densely punctate, the former distinctly impressed along the middle.....*maculatum*.

Size rather small; pronotum very finely, elytra generally densely and more coarsely punctate; pronotum not distinctly impressed in the middle.

Elytra less than one-half longer than the pronotum.

Sides of the prothorax very strongly arcuate.....**puberulum.**

Sides of the prothorax very feebly arcuate..... **alutaceum.**

Elytra more than one-half longer than the pronotum.

Elytra coarsely and not densely punctate.....**pilosellum.**

Elytra very finely and densely punctate.

Interocular striæ very fine; ocelli minute and distinct..**veterator.**

Interocular striæ deep; ocelli large, not very well defined.

crassicorne.

Elytra dull, very finely and transversely rugulose.....**opaculum.**

The genus is probably a very extensive one in California, which region also appears to be very rich in the entire group Homalini.

PELECOMALIUM n. gen. (Homalini).

Body depressed, winged; elytra longer than the prothorax; antennæ filiform, very feebly incrassate, front not produced. Maxillary palpi with the first joint small; second elongate, slender; third and fourth flattened, the former slightly longer than wide, obconical; fourth about one-half longer than the third, strongly securiform. Labial palpi small; first joint very small; second much wider and longer, slightly longer than wide, sides parallel, tip transversely truncate; third slender, oblique, truncate at tip, sides nearly parallel, much narrower and slightly longer than the second; second and third joints flattened. Posterior tarsi very long and slender, shorter than the tibiæ; first and second joints elongate, the former much the longer; fourth deeply bilobed. Posterior tibiæ slender, terminated by two slender, unequal spurs and several small spines. Tibiæ rather finely and sparsely pubescent, having a very few small lateral spines.

It will be seen from the above diagnosis that this genus bears a great resemblance to *Amphichroum*, and in fact if the palpi were removed, it would be almost impossible to distinguish *P. modestum* from *A. veterator*, so great is the resemblance in every feature of the body, antennæ and legs.

The two species described below may be recognized by the following characters:—

Size large; elytra coarsely and rather sparsely punctate.....**binotatum.**

Size small; elytra finely and very densely punctate.....**modestum.**

P. binotatum n. sp.—Rather robust; body and legs throughout dark rufo-testaceous; head, abdomen, and under surface except the prosternum, black; elytra and hypomera rather paler and more luteous; each elytron having a median apical spot of piceous-black, clearly limited and very distinct; antennæ piceous-black, three basal joints abruptly pale testaceous; palpi and mandibles same; head and prothorax alutaceous, remainder shining; pronotum almost glabrous; elytra and abdomen finely and very sparsely pubescent, the latter toward the sides only. *Head* slightly longer than wide, depressed, nearly flat, transversely and feebly impressed between the antennæ, finely, not deeply and obliquely bistriate between the eyes; surface finely and strongly granulose and subrugulose, impunctate; antennæ scarcely two-fifths as long as the body, very slightly flattened and incrassate toward tip; joints one, and three to seven nearly equal in length and one-half longer than the second; joints seven to ten rather rapidly decreasing in length, the latter one-fourth longer than wide. *Prothorax* anteriorly as wide as the head, widest in the middle, about one-fourth wider than long; sides parallel, evenly and moderately arcuate throughout; apical angles rather narrowly rounded, basal very broadly so; apex and base equal in width, the former broadly and distinctly sinuate throughout, the latter very feebly and broadly sinuate in the middle; disk very broadly and very moderately convex, narrowly and obsoletely impressed along the middle, broadly and very feebly so near the scutellum, narrowly and abruptly explanate anteriorly at the sides, more broadly and gradually so thence to the base, finely and strongly reticulate, excessively minutely, sparsely and feebly punctate except near the sides and especially along the base, where the punctures are closer, larger and deeper. *Elytra* at base as wide as the pronotum; sides feebly though distinctly divergent; apical angles moderately broadly rounded; together transversely truncate behind; disk depressed, about as long as wide, two-thirds longer than the pronotum, finely margined along the suture, rather coarsely, strongly, evenly and rather sparsely punctate. *Abdomen* about as wide as, and slightly shorter than, the elytra; sides convergent and strongly and evenly arcuate to the vertex; border rather narrow and feebly inclined, finely and densely punctate; surface broadly polished and impunctate in the middle. *Legs* slender. Length 4.7 mm.

California; (Marin Co. 1). Mr. Harford.

In the type of this very interesting species the middle tibiæ are broadly and strongly emarginate interiorly at one-third the length from the apex, the others being perfectly entire.

P. modestum n. sp.—Moderately slender; head and abdomen black; pronotum, except the lateral limbs, narrowly, and a short basal margin, antennæ toward tip, and elytra, dark blackish-castaneous, the latter having on each side near the humeri a small, very indefinite spot of slightly paler tint; an-

tennæ toward base, palpi, pronotal and elytral hypomera and anterior legs pale testaceous; middle and posterior legs infusate throughout; remainder of the under surface blackish; head and pronotum very feebly alutaceous, remainder shining; head glabrous, pronotum and elytra finely and densely pubescent. *Head* very slightly longer than wide, broadly and feebly impressed between the antennæ, finely, very feebly and obliquely bistrate between the eyes; surface finely and rather feebly reticulate, impunctate; ocelli small, round, distinct; antennæ long and slender, more than one-half as long as the body; joints one and three subequal in length, distinctly longer than the succeeding ones; joints two and four to seven nearly equal in length, tenth fully one-third longer than wide, cylindro-obconical. *Prothorax* anteriorly slightly narrower than the head, widest near the middle, where the sides are nearly evenly and moderately arcuate, slightly straighter toward the apex and base and very slightly more strongly convergent in the former direction; apex slightly narrower than the base, broadly and very feebly incurvate; the latter broadly and very feebly arcuate; apical and basal angles moderately broadly rounded, the former the more strongly; disk nearly one-half wider than long, moderately and evenly convex, not at all impressed, abruptly and narrowly explanate at the sides anteriorly, more broadly and gradually so toward the basal angles, where it is also slightly reflexed, extremely finely, evenly, feebly, subasperately and rather densely punctate, finely and distinctly reticulate. *Elytra* at base scarcely as wide as the pronotum; sides very feebly divergent and arcuate; apical angles moderately broadly rounded; disk depressed, quadrate, nearly three-fourths longer than the pronotum, very densely, rather finely, deeply and evenly punctate. *Abdomen* produced slightly at the apex, the last segment being rather long and slender; as wide at base as the elytra, polished, feebly and finely punctate near the sides, impunctate in the middle. *Legs* slender. Length 2.7 mm.

California; (Lake Co. 2). Mr. Fuchs.

Readily distinguishable from the preceding by its much smaller size, more transverse prothorax, finer and much denser elytral punctuation and coloration. Its approximation in appearance to *Amphichroum veterator* has been before alluded to, and is most remarkable; it is a smaller and slightly more slender species than the latter, but in pronotal and elytral form and punctuation it is almost precisely similar.

LATHRIMÆUM Erichs.

L. humerale n. sp.—Rather robust, moderately convex; head blackish, epistoma dark rufous; pronotum dark rufous, obscurely piceous in the middle; elytra pale luteous, dark rufous at the apices, immediately before

which there is a large rather indefinite area of dark piceous obliquely limited just behind the middle; on each elytron there is also, just before the middle, a small obscure spot of dark castaneous, not attaining the suture, and parallel to the oblique edge of the posterior spot; abdomen dark rufous; entire under surface and legs bright rufo-testaceous; antennæ piceous, apical joint paler, first three joints very dark rufo-fusces, nearly glabrous, remainder finely and densely pubescent; integuments nearly glabrous; highly polished. *Head* slightly wider than long, convex along the middle, broadly impressed along the sides, obliquely and very feebly bisulcate between the eyes, finely and not very densely punctate; sides behind the eyes short, rectangular, ocelli rather large, very prominent; eyes moderately prominent; antennæ distinctly shorter than the head and prothorax together, feebly incrassate; third joint slender, distinctly longer than the second or fourth; the latter subequal, distinctly longer than the fifth, which is nearly one-half longer than wide; tenth slightly wider than long. *Prothorax* widest slightly behind the middle, where it is three-fourths wider than long; sides thence rather strongly convergent, strongly and evenly arcuate to the very broadly rounded apical angles, and slightly less strongly convergent and straight to the basal angles, which are obtuse and not rounded; edges finely serrulate; base broadly and very feebly arcuate, four-fifths as wide as the disk and wider than the apex; the latter truncate in the middle between the broadly rounded and slightly advanced lateral apices; disk rather strongly convex in the middle, where there is a rather deep longitudinal sulcation, limited laterally by two narrow well-defined ridges which terminate at one-third the length from the base; on each side, exterior to these, there are two rather strong, irregular elevations, thence to the lateral edges the surface is broadly explanate and feebly reflexed, broadly and very feebly impressed at the middle of each side; surface very coarsely, deeply and irregularly punctate; punctures sparser toward the sides. *Elytra* one-third wider than the pronotum, at base equal to it in width; sides nearly parallel and somewhat strongly arcuate; together broadly subtruncate behind; exterior angles broadly rounded; disk strongly convex, slightly less strongly declivous behind than on the sides, nearly one-third longer than wide, two and one-half times as long as the pronotum, coarsely, deeply punctate; punctures closely placed in rather well-defined striæ; intervals rather feebly convex, the third and seventh more strongly so; the latter near the humeri very strongly so. *Abdomen* very short and narrow behind the elytra, having two almost impunctate segments exposed. *Legs* long and very slender; posterior tarsi short, first two joints slightly elongate, the first slightly the longer; fifth much shorter than the first four together. Length 4 3 mm.

California; (Humboldt Co. 1).

The under surface, except the pronotal hypomera, and including the elytral hypomera, is very coarsely and deeply punctate; the abdomen finely subalutaceous and almost

impunctate. The femora are very sparsely pubescent, the hairs being very short, stout and recumbent; the tibiae finely and densely spinulose. The mesosternum is finely carinate in the middle anteriorly. The maxillary palpi are very slender and filiform, the third joint being twice as long as wide, the fourth being very slender, pointed and more than twice as long as the third.

This species differs from *pictum* Fauv. in elytral structure, that species having all the elytral intervals equally and very feebly convex, and from *subcostatum* Mäkl. in the shape of the prothorax.

OROBANUS Lec.

O. rufipes n. sp.—Rather slender, cuneate; black throughout except the eleventh joint of the antennæ which is testaceous, and the legs which are rufous throughout; integuments shining; pubescence rather long, very fine, dense, recumbent, dark grayish-brown in color. *Head* moderate; eyes at nearly their own length from the base, moderately prominent, rather finely granulate; sides behind them feebly convergent and strongly arcuate, prominent; front feebly convex, very finely and extremely feebly punctate; having on a line slightly in advance of the middle of the eyes two deeply impressed, narrow, oblique and very short canaliculate punctures; ocelli minute, circular; antennæ moderate, slender, filiform, slightly less than one-half as long as the body; joints two to six subequal in length, the former slightly more robust and very slightly shorter; joints six to ten decreasing in length, the former nearly three times as long as wide, the latter distinctly thicker and three-fourths longer than wide, eleventh slender, shorter than the two preceding together, finely acuminate, compressed near the tip. *Prothorax* cordate, widest at one-third its length from the apex, where it is distinctly wider than the head and very slightly wider than long; sides very moderately convergent posteriorly, deeply and evenly incurvate throughout, strongly arcuate anteriorly; basal angles slightly obtuse, very slightly rounded; base broadly, evenly and very feebly arcuate, about three-fourths as wide as the disk and very slightly wider than the apex; the latter broadly, evenly and just visibly emarginate; apical angles almost obsolete; disk strongly and nearly evenly convex, having near the base a transverse row of small feeble erosions, and at each side, just before the middle, a rather strong impression which is continued posteriorly, gradually becoming more feeble and disappearing before reaching the basal angles; very finely, feebly, evenly and somewhat densely punctate. *Elytra* at base slightly wider than the prothorax, widest at the apex where together they are slightly less than twice as wide as the prothorax; sides nearly straight; each elytron broadly rounded behind; hu-

meri broadly rounded; disk depressed, with a feebly impressed line on each parallel and near the suture, minutely, evenly, very feebly and not very densely punctate, slightly more than twice as long as the prothorax, one-third longer than wide. *Abdomen* at base slightly narrower than the elytra; sides convergent to the apex, strongly and evenly arcuate; extremely minutely, densely and asperately punctate. *Legs* slender; first joint of the posterior tarsi distinctly longer than the next two together, much longer than the fifth. Length 3.0-3.7 mm.

California; (Hoopa Val., Humboldt Co. 7).

The type is a male, the sixth segment being broadly and feebly emarginate at tip; in the female the prothorax is much more distinctly wider than long and less strongly cordate; the antennæ are slightly shorter and do not attain the middle of the elytra; in size the female is smaller than the male.

There is scarcely a trace of a median sulcation on the pronotum, the sides of which are more deeply sinuate toward the basal angles than in either *densus* or the Vancouver representative of *simulator*. The species is chiefly remarkable because of its slender form, sparse punctuation and rufous legs. It was found in wet moss in the interior of a flume for conveying spring-water.

O. densus n. sp.—Rather robust, depressed; body entirely black above and beneath, oral organs rufo-testaceous; legs fuscous throughout; antennæ entirely piceous-black; pubescence cinereous, rather short, recumbent, extremely dense; integuments shining. *Head* moderate, slightly longer than wide; sides behind the eyes strongly convergent to the neck and strongly arcuate; eyes rather prominent, large, coarsely granulated, very densely setose; front depressed, feebly biimpressed between the eyes, finely and densely punctate, more sparsely so along the middle; antennæ filiform, fully one-half as long as the body; basal joint subcylindrical, three times as long as wide, second two-thirds as long as the third, the latter slightly shorter than the first, joints three to six equal, slender, six to ten gradually diminishing in length, the latter more than twice as long as wide, eleventh fusiform, slightly oblique at tip, one-half longer than the tenth. *Prothorax* widest at the anterior third, where it is distinctly wider than long and slightly wider than the head; sides strongly arcuate, strongly convergent and distinctly and evenly sinuate toward the base; apex transversely truncate, about equal in width to the base which is broadly, evenly and very feebly arcuate; basal angles slightly obtuse, very narrowly rounded; disk transversely, evenly and moderately convex; impress-

ed in the middle near the lateral edges, the impression becoming extinct toward the basal angles, finely, evenly and very densely punctate. *Elytra* at base two-fifths wider than the prothorax; sides distinctly divergent, nearly straight, slightly obliquely truncate at apex; exterior angles broadly, inner more narrowly, rounded; humeri broadly rounded; disk feebly convex, broadly and feebly impressed on the suture toward base, nearly one-third longer than wide, two and one-half times as long as the prothorax, very finely, evenly and extremely densely punctate. Three segments of abdomen exposed together wider than long, as wide as the base of the elytra; margin distinct, inclined; surface feebly convex, finely, very feebly and very densely punctate. Under surface and legs finely and densely pubescent, less densely so toward the tip of the abdomen. Length 3.4-3.9 mm.

California; (San Diego 3). Mr. W. G. W. Harford.

Distinguishable immediately from the preceding by its more depressed and broader form, more parallel elytra, nearly three times as dense punctuation, darker legs, etc. It differs from *simulator* in its much denser punctuation and more depressed form.

The three species may be distinguished as follows, the characters of *simulator* being taken from a specimen from Vancouver Island, kindly loaned me by the Museum of Comparative Zoölogy at Cambridge:—

Legs dark fuscous.

Surface polished; strongly convex.....*simulator*.

Surface under low power dull; very depressed.....*densus*.

Legs clear rufous; punctuation more sparse; form more slender.....*rufipes*.

Since it is now known that there are several distinct species of this genus, the absolute identity of the Vancouver specimens taken by Crotch with *simulator* Lec., which was described from the regions east of the Rocky Mountains, may reasonably be questioned; a careful comparison of the two is therefore very desirable. By careful comparison of the above Vancouver type with the description given by Dr. Le Conte and M. Fauvel, I am inclined to believe that the former is a fourth species, hitherto undescribed. M. Fauvel mentions the prothorax as being longer than wide; if this is actually the case, it is very distinct from any of the

specimens before me, all of which have it distinctly wider than long.

ACTIDIUM Matth.

A. rotundicolle n. sp.—Rather robust, strongly convex, piceous-black; legs and palpi pale flavo-testaceous; antennæ pale testaceous at base, becoming piceous-black at apex; pubescence fine, very short, not at all dense; integuments shining, subalutaceous. *Head* much wider than long, rather convex, very minutely and sparsely punctate; eyes moderate, rather prominent, coarsely granulate; antennæ as long as the head and prothorax together; funicle slender; club robust; joints increasing in length and thickness. *Prothorax* slightly wider than the head, about equal in length, two-thirds wider than long; sides parallel and strongly, evenly arcuate; base broadly arcuate, distinctly sinuate laterally; basal angles obsolete; apex broadly truncate; disk broadly, evenly convex, very minutely reticulate or subgranulose, minutely, evenly and sparsely punctate. Scutellum small, equilatero-triangular, coarsely asperate. *Elytra* at base as wide as the prothorax; sides parallel for two-thirds the length from the base, rather strongly, evenly arcuate, thence feebly convergent, very feebly arcuate to the apex which, conjointly, is rather abruptly truncate; exterior angles broadly rounded, inner angles narrowly rounded; disk widest at nearly two-fifths its length from the base, nearly one-half longer than wide, one-half longer than the head and pronotum together, strongly cylindrically convex, minutely, densely reticulate or subgranulose, shining, very minutely, evenly, rather sparsely, subasperately punctate; punctures without definite arrangement. *Legs* rather long, somewhat slender; posterior tibiæ very slender toward base; rapidly dilated, widest at the apical third, compressed; tarsi short, very slender. Length 0.4 mm.

Texas; (Galveston 2).

This species differs from those previously described from California in the sculpture which is much more feeble, and in the form of the prothorax. It is as robust as *robustum* and does not appear to possess many characters in common with the three species described by Mr. Matthews.

PTILIUM Erichs.

P. sulcatum n. sp.—Rather slender and convex; sides nearly parallel; color pale brownish-testaceous, antennæ and legs slightly paler, more flavate; integuments coarsely sculptured, shining; pubescence fine, subrecumbent, not very dense. *Head* moderate in size, much wider than long, triangular; surface moderately convex, rather coarsely, irregularly and feebly tubercu-

late; eyes small, at the base, convex, prominent, coarsely granulate; antennæ rather long, distinctly longer than the head and prothorax together; two basal joints robust; funicle very slender; club strong, joints increasing in length and thickness. *Prothorax* widest at two-fifths its length from the apex, where it is distinctly wider than the head, one-half wider than long; sides strongly arcuate anteriorly, strongly convergent and very feebly sinuate toward base; the latter broadly, extremely feebly arcuate throughout, very slightly narrower than the apex, nearly three-fourths as wide as the disk; apex transversely truncate throughout; basal angles obtuse, scarcely perceptibly rounded; disk transversely, moderately convex, densely, feebly, irregularly tuberculate or granulose, the tubercles nearly confluent and differing greatly in size; in the center there is a small, strongly marked canaliculation two-fifths as long as the disk, and, at each basal angle, a small impressed puncture. *Elytra* at base as wide as the prothorax; sides parallel, distinctly and nearly evenly arcuate; together abruptly, very broadly rounded behind; apex broadly truncate; disk widest in the middle, where it is distinctly wider than the prothorax, nearly one-half longer than the head and prothorax together, rather depressed in the middle, rather abruptly, strongly convex at the sides, finely, evenly, not very densely, subasperately punctate; asperities not definitely arranged. Scutellum moderate, asperate, triangular, slightly wider than long. Under surface pale brownish-testaceous, except the abdomen toward base, which is dark, blackish-piceous. *Legs* rather slender, short; tarsi rather short, very slender. Length 0.35 mm.

Texas; (Austin 1).

This species can be readily recognized by its very minute size, there being but one smaller species of Coleoptera known; it is also distinguished by the peculiar form and structure of the prothorax. The metasternum appears to extend to the elytra at the sides.

P. Hornianum Matth., which is of about the same size as the present species, differs from it in color, shape and sculpture.

SMICRUS Matth.

S. americanus n. sp.—Rather elongate; sides parallel; body depressed, black; legs and antennæ pale, dusky yellow; pubescence rather long, recumbent, not very dense; integuments shining. *Head* large, triangular, slightly wider than long; eyes large, strongly convex, prominent, coarsely setose; surface feebly convex, smooth, obsoletely and finely reticulate; labrum prominent, acutely rounded; second joint of antennæ distinctly shorter than the first, both rather slender and elongate. *Prothorax* as long as the head, very slightly wider, three-fourths wider than long, widest in the middle; sides

parallel, evenly and very feebly arcuate throughout, not at all constricted at base; apex broadly, very feebly and evenly emarginate throughout its width; angles slightly acute, very narrowly rounded; base transversely truncate and straight throughout its width; angles nearly right, not rounded; disk broadly, feebly convex, more strongly so near the sides, not very densely covered with rather fine, flat, somewhat indefinite tubercles. Scutellum large, triangular, feebly, rather densely asperate. *Elytra* equal in width to the prothorax; sides parallel, nearly straight, abruptly transversely truncate behind; outer angles narrowly rounded; disk scarcely one-fifth longer than wide, very slightly longer than the head and prothorax together, depressed in the middle, rather convex at the sides, finely, feebly, not very densely asperate; asperities not definitely arranged. *Abdomen* with four fully exposed segments, the fifth, the basal, also being almost completely exposed; together as long as wide; outline parabolic; surface rather convex, rather finely, not densely, very feebly asperate or subgranulose, margined laterally with a flat border, becoming attenuated posteriorly; last segment as long as the three preceding together, rounded at apex. *Legs* rather short and robust. Length 0.9 mm.

Texas; (Austin 1).

The entire abdomen, extending under the elytra, is composed of eight segments; the under surface is polished and very feebly transversely asperate along the apex of each segment, and the apical two-thirds of the terminal; the latter at apex has a narrow, porrected, pale membranous border. The antennæ in the type are missing with exception of the two basal joints.

The apex of the abdomen, more especially beneath, and the sides of the elytra toward the base, are slightly pale. The abdominal border beyond the elytra is not appreciably elevated, and its surface is almost continuous in convexity with that of the upper surface; under the elytra and toward the base of the abdomen it becomes thinner, deep and erect.

This species differs greatly from *flicornis* Fairm. in the structure of the pronotum, which is not at all constricted at base.

DITAPHRUS n. gen. (Byrrhidæ.)

Body oval, pubescent. Head deflexed, retractile; eyes large, rather coarsely granulated, nearly hidden in repose, front excavated at the sides near the

eyes for the reception of the antennæ when in repose; epistoma very small, deflexed, divided by a fine distinct, straight suture; labrum small, transverse, vertical, detached from and covered by the epistoma; antennæ inserted under the sides of the front, immediately before the eyes, 11-jointed, base thick, gradually diminishing in thickness to the sixth joint, seven to nine very small, tenth wider, small, transverse, eleventh widest, longer than wide, ovoidal, maxillary palpi small, last joint slightly longer than wide, ovoidal, pointed, slightly compressed. Prosternum well developed, transversely truncate anteriorly, widely separating the anterior coxæ; process transversely truncate at apex, on the same level and in contact with the anterior edge of the mesosternum; the latter extremely short, strongly transverse, very broadly and feebly emarginate anteriorly; metasternum large, long; episternum narrow, elongate, obliquely truncate anteriorly, widest and angulate anteriorly near the apex; metasternum slightly excavated at the side anteriorly for the reception of the tips of the intermediate femora, the excavation extending very deeply and obliquely into the base of the elytral hypomera. Anterior coxæ very small, transverse, attenuate laterally, open behind, widely separated; trochanters large; middle coxæ not at all prominent, transversely oval, very widely separated; trochanters large; posterior coxæ strongly transverse, attaining the metasternal episterna, short, distinctly separated. Ventral segments five; three basal not distinctly connate; first four uniformly and gradually decreasing in length; fifth as long as the two preceding together; first segment deeply and transversely excavated at base for the reception of the posterior femora. Prothorax short, broad; sides with an acute edge; inflexed sides divided from the prosternum by a very distinct suture; prosternum laterally and inflexed sides deeply and transversely excavated for reception of the anterior femora; pronotum excavated laterally at apex for reception of antennal club. Scutellum small, triangular. Elytra convex, covering the entire abdomen; hypomera distinct, extending only for two-fifths the length from the base, devoid of hypopleuræ. Legs short, rather slender; femora not very robust, excavated along the lower edge for reception of the tibiæ; the latter simple, rather slender, not grooved, having a line of short, very fine, densely placed cilia along the outer edge; tarsi free, rather short, five-jointed joints simple; first of the anterior as long as the next two together; two to four very small; fifth as long as the three preceding together; claws divergent, small, simple, slender.

This genus is very remarkable in antennal structure, in its excavated pronotum and many other characters. The single representative almost exactly resembles a minute *Seymnus* in external form.

The median portions of the three sterna form a continuous surface from the head to the posterior coxæ, the meso-

sternum being not at all depressed or impressed, and divided from the metasternum by a very feeble straight suture.

Ditaphrus is related to Bothriophorus Muls., but is very distinct in antennal structure and in the form of the prosternum, this not being broadly emarginate at apex, nor "postérieurement rétréci en point," as in the latter. From Physemus Lec. it is apparently distinguished by its antennal structure.

D. scymnoides n. sp.—Form elliptical, distinctly longer than wide, convex, black; under surface, legs and antennæ fuscous; integuments alutaceous; pubescence fine, pale, short, subrecumbent, rather dense. *Head* rather small, wider than long; surface broadly, evenly convex, finely, deeply and densely punctate; punctures coalescent and scabrous at base; antennæ as long as the width of head; occiput margined laterally along the eyes with a narrow impressed channel for the reception of the antennæ which joins the deep apical excavation of the pronotum. *Prothorax* about three times as wide as long; sides convergent anteriorly, feebly arcuate; base broadly arcuate, abruptly more strongly so in the middle; apex broadly emarginate; surface broadly convex, very minutely, deeply, evenly, not very densely punctate; punctures separated by three or four times their own diameter. *Scutellum* slightly longer than wide. *Elytra*, viewed vertically, nearly three times as long as the head and prothorax together, widest at one-third the length from the base; sides strongly arcuate, coarctate with those of the pronotum, evenly rounded to the apex which, conjointly, is rather narrowly rounded; surface strongly convex, rather finely, evenly, deeply and moderately densely punctate; punctures decidedly larger than those of the pronotum, distant by two to three times their own diameters. *Legs* short; tarsi slightly reflexed. Under surface alutaceous and minutely punctate; abdomen finely, rather densely pubescent. Length 0.8–1.0 mm.

Texas; (Austin 11; El Paso 1).

Rather abundant amongst decaying vegetable matter on the soft mud left by the receding water of the Colorado River. The antenna is figured on the plate and is seen to be of very singular structure. The club in Physemus, the only genus with which this can be confounded, is described as being three-jointed and almost solid. It is also highly probable that Physemus is distinct from Bothriophorus. These three genera should be separated as a group distinct from Limnichus.

In the Californian species of *Limnichus*, the prosternum is very long, prolonged between the coxæ, the apex of the process being strongly rounded and entering a deep emargination of the mesosternum; along the middle the surface is deeply grooved. The first two ventral segments are subequal in length, the first three connate. The first four joints of the anterior tarsi are short, equal and together but slightly longer than the fifth. The antennæ are eleven-jointed; club loose, three-jointed, joints gradually increasing in thickness; first joint, as in *Ditaphrus*, deeply seated in the lateral excavation of the front.

I have carefully verified this observation regarding the number of antennal joints in three or four species of *Limnichus* and several specimens of *Ditaphrus*, and can state with great certainty that the antennæ are not 10-jointed, as represented (Class. Col. N. A., LeConte and Horn pp. 159, 161). Du Val had already corrected this error in his classic work on the genera of European Coleoptera (Vol. II, p. 267 foot-note).

ELEATES n. gen. (Tenebrionidæ).

Body oblong, strongly convex. Epistoma and sides of the front coarctate at apex, very broadly and evenly arcuate; front distinctly dilated before the eyes; the latter small, completely divided by the lateral edges, more than their own length in front of the prothorax; epistoma transverse, enclosed by the front; suture distinct and impressed in the middle. Maxillary palpi scarcely at all dilated; third joint distinctly longer than wide, slightly shorter than the second; fourth twice as long as wide, distinctly longer than the second, subcylindrical, slightly bent and compressed, obliquely truncate at tip. Labial palpi rather small; third joint most robust, longer than the first two together, ovoidal, narrowly and obliquely truncate at tip. Mentum moderate, wider than long, its plane below the general surface of the head; ligula large, strongly and broadly bilobed; lobes almost entirely exposed. Maxillæ exposed at the sides. Antennæ gradually and very strongly incrassate, very strongly compressed; second joint globular, one-half as long as the third; the latter longer than the succeeding joints; four to seven, densely spongiose at the exterior apical angles; the remainder more extensively so and at both apical angles; joints more strongly pointed outwardly than on the inside; five to ten transverse, the latter very strongly so; eleventh large, as wide as the tenth, as long as wide, obliquely conoidal; antennal grooves deep near the eyes, obliterated in the middle. Anterior coxæ transversely oval,

strongly convex, slightly separated. Middle coxæ with small trochanters; posterior transverse, separated by a triangular process of the first ventral segment. Tibiæ scarcely dilated; spurs small but distinct, unequal; tarsi moderate, setose beneath, the posterior more densely so at base; last joint slightly longer than the preceding together; first four joints of the anterior and middle very short equal; first of the posterior as long as the next two combined. Elytral hypomera continuous throughout the length, rather narrow, strongly inflexed, nearly equal in width throughout, slightly concave near the base, elsewhere plane. Prothorax transverse; sides of the pronotum very abruptly and narrowly explanate or feebly reflexed; edges neither denticulate nor crenulate. Elytra finely costate; intervals punctate.

The affinities of this genus are very readily seen to be in the direction of *Bolitophagus* and *Eledona*; it agrees with the first in the structure of the front and eyes, but differs in appearance, in this respect agreeing more closely with *Eledona*, from which, in turn, it differs radically in the structure of the eyes. In *Eleates* the epistoma is separated from the labrum by a very short, coriaceous bond, as is usual in this group, but the eyes are well in advance of the prothorax. It differs from both *Bolitophagus* and *Eledona* in the non-denticulate sides of the prothorax, a character considered more or less important by Lacordaire and Du Val, who divide the European genera into groups depending upon the presence or absence of denticulations.

E. occidentalis n. sp.—Rather robust; sides nearly straight and parallel; black throughout; legs, palpi and antennæ dark rufo-fuscous; glabrous; integuments rather finely sculptured. *Head* nearly twice as wide as long; apex very narrowly reflexed throughout; surface near the apex and in front of the eyes slightly tumid; front broadly and feebly convex, extremely densely, rather deeply and coarsely punctate; punctures very much finer and obsolete on the epistoma. *Prothorax* widest near the base, where it is two-thirds wider than the head and twice as wide as long; sides feebly convergent from base to apex, feebly arcuate; base broadly arcuate, more strongly so in the middle; angles slightly obtuse, not rounded; apex slightly narrower than the base, broadly and rather strongly emarginate; angles slightly prominent, anteriorly narrowly rounded; disk broadly, strongly and very evenly convex, rather coarsely, evenly, deeply and excessively densely punctate; punctures polygonal, intervals in the form of very narrow, strongly elevated lines. *Scutellum* broader than long, rounded behind. *Elytra* at base slightly wider than the prothorax; sides nearly parallel and straight to within a very short distance of the apex, where, together, they are abruptly and very broadly rounded;

humeral angles distinctly rounded; sides narrowly reflexed, edges acute; disk broadly and very strongly convex, nearly three times as long as the pronotum; ridges very fine, rather feebly elevated; intervals evenly concave, each with a single series of round, rather deep punctures, distant by slightly more than their own widths; along each side of the immediate crests of the costæ there is a line of very small, round, closely-placed areolæ; remainder of the surface slightly and irregularly roughened or subalutaceous, moderately shining. *Legs* moderate; femora compressed, excavated beneath through two-thirds the length for the reception of the tibiæ; tibial spurs situated at the inner apex, arranged parallel to the lower edge of the apex and almost in line with the point of insertion of the tarsi, claws large, simple, divergent. Length 4.5-5.0 mm.

California; (Truckee, Nevada Co. 2). Mr. Harford.

The lateral edges of the prothorax are sometimes extremely feebly and irregularly undulated.

This species, the first of its tribe to be announced from the Pacific slope of the continent, lives in fungus growing upon fallen logs.

BARINUS n. gen. (Curculionidæ.)

Body rather slender and elongate, clothed with large, elongate scales, entirely without hairs. Beak very short, rather stout, much shorter than the prothorax, slightly flattened, rather strongly arcuate; scrobes beginning slightly before the middle, descending obliquely to the eyes; the latter large, vertically oval, not very prominent, finely granulated; interocular surface scarcely wider than the beak, feebly impressed. Antennæ rather slender; first joint of funicle slightly shorter than the scape, rather strongly clavate, very slender toward base, nearly as long as the remainder of the funicle; second to seventh nearly equal, cylindrical, more slender than the apex of the first; club abrupt, very elongate, oval, finely pubescent, slightly longer than the preceding six joints of the funicle combined. Prothorax without postocular lobes. Prosternum rather long in front of the coxæ, rather narrowly and deeply sulcate throughout its length, moderately separating the coxæ. Middle and posterior coxæ widely separated. Metasternum longer than the first ventral segment. First two segments of the abdomen rather long, nearly equal in length; suture almost entirely obliterated in the middle; third and fourth segments short, equal, together scarcely longer than the first; fifth rounded behind, as long as the third and fourth together; posterior sutures strongly sinuate at the sides. Elytra conjointly rounded at tip, concealing the pygidium. Legs moderate in length, rather robust; tibiæ not grooved, all mucronate at tip; spur of the anterior and middle pairs vertical, of the posterior oblique and nearer the insertion of the tarsi; all very small and robust; second and third

joints of the tarsi broadly dilated, the latter strongly bilobed; fourth slender; claws very small, narrow, connate throughout their length except at the immediate apex.

It will be noticed that this genus corresponds quite closely with *Zygobaris*, and I have drawn up the description in such form that it can be readily compared with the one given by Dr. LeConte for the latter (Proc. Am. Phil. Soc. XV, p. 321). It differs conspicuously in its shorter beak, in antennal structure and in its strongly grooved prosternum; also in the claws, which are connate nearly through their length.

B. squamolineatus n. sp.—Form very narrowly elliptical, moderately convex, black; legs and antennæ dark fuscous; coxæ black; integuments shining. *Head* rather small, hemispherical, subalutaceous, finely and not very densely punctate, with a few small robust scales along the inner margins of the eyes; beak scarcely twice as long as the head, slightly enlarged and flattened toward tip, finely and rather densely punctate toward the base, much more sparsely so near the apex. *Prothorax* about as long as wide, very feebly constricted near the apex, sides very feebly convergent from base to apex, abruptly and more strongly arcuate behind the constriction, base broadly arcuate, more strongly so in the middle; apex transversely truncate, three-fifths as wide as the base; disk transversely, nearly evenly and strongly convex, coarsely, rather densely and evenly punctate; punctures round, deep, perforate, separated by about their own width, distinctly finer along the apex; surface abruptly and densely squamose at the sides, with a narrow, sparsely squamose line along the middle; elsewhere each puncture bears a very minute, slender scale; scales all arranged transversely. *Elytra* at the humeri slightly wider than the prothorax; sides gradually convergent, broadly and nearly evenly arcuate to the apex, which, conjointly, is rather narrowly rounded; humeri longitudinally and rather strongly swollen; disk transversely and rather strongly convex, fully twice as long as the pronotum, extremely feebly constricted at one-fifth the length from the apex, deeply and narrowly grooved; striæ finely, deeply and rather distantly punctate; intervals finely, feebly and more closely punctate, alternating broader and narrower; the narrow intervals having a single, the broad ones two rows, of large elongate scales arranged longitudinally; humeral row broader; the scales along the suture and also those near the sides very much smaller and narrower. Scutellum slightly longer than wide, oval. *Legs* finely and rather sparsely squamose; tarsi densely covered above with fine hair-like scales, densely spongiöse beneath. *Abdomen* densely squamose at the sides, sparsely so in the middle; devoid of scales along the bases of the last three segments. Length 3.8 mm.

Central Illinois 1; Mr. F. M. Webster.

The scales are generally white, but are slightly darker along the flanks of the elytra, where they are very small. The rows of scales upon the elytral intervals are not uniformly single or double, but in many spots become more crowded and irregular.

RENOCIS n. gen. (Hylurgini).

Body subcylindrical. Head prominent, not concealed by the prothorax, inserted in the prothorax nearly to the eyes; slightly deflexed, not at all produced, beak entirely obsolete; eyes rather finely granulated, not at all prominent, on the sides, extending slightly under the head, short, very strongly transverse, with a small feeble sinuation in the anterior margin; antennæ inserted on the sides of the head just before the eyes, short, ten-jointed; basal joint longer than wide, rather robust; second not one-half as long, subglobular; three to six very small; joints seven to ten forming a very abrupt, elongate, oval club, longer than the entire preceding portion, strongly compressed, sparsely pubescent. Mandibles prominent, short and stout, perfectly chisel-shaped apex transversely truncate, straight; inner face at apex obliquely truncate. Mentum short, transverse; maxillæ, ligula and palpi very small, invisible under a mass of coarse hair surrounding the mentum. Labrum wanting. Anterior coxæ prominent, subglobular, contiguous; middle coxæ widely distant, small, not prominent; posterior separated, transverse, attenuated laterally, only attaining the metasternal episternum, which is long, rather wide; sides parallel; epimeron not visible. Anterior coxæ in contact with the head beneath; prosternum entirely obsolete before them; femora rather robust, simple; tibiæ very narrow at base, rapidly dilated and compressed toward apex, margined externally with a row of short, very robust spinules, obliquely truncate at apex; tarsi rather short, slender, not at all dilated but rather compressed, five jointed; third obliquely truncate and slightly produced beneath, not bilobed; fourth very minute; fifth slender, longer than the preceding united. Abdominal segments five in number; first two subequal, each nearly as long as the third and fourth together. Elytra covering the entire abdomen; pygidium invisible; prothorax strongly rounded at the sides, transverse, convex; sides continuous in curvature from the dorsal surface to the anterior coxæ. Integuments covered with a dense scabrous mass of scales; base of elytra elevated and tuberculate. Scutellum not distinctly visible.

In this genus the antennal club is strongly compressed, elongate-oval, obtusely pointed and four-jointed, the joints being connate and separated by straight transverse sutures. Both surfaces are glabrous, except the apices of the joints,

which are fringed with hairs, and the terminal joint which is sparsely pubescent over the entire surface. The scape is rather short and robust, distinctly shorter than the funicle and is not received in transverse grooves in front of the eyes, these being almost completely obsolete. The genus therefore seems to form a group intermediate in many of its characters between the Polygraphi and the Hylurgi, but for the present it should be placed between Chætophlœus and Carphoborus, from the latter of which it differs in the structure of the elytra behind,—these being evenly convex with no spinulose crests,—and in the structure of the antennal club, which is here divided by three sutures, and not by two, as in Carphoborus.

R. heterodoxus n. sp.—Oblong; sides parallel; integuments black, densely clothed with scales mostly dark fuscous in color, but interspersed with whitish ones especially on the flanks and toward the base of the pronotum, replaced on the head by a dense growth of longer, robust, shaggy pubescence. *Head* wider than long; front impressed, coarsely and sparsely punctate, shining; antennæ dark brown. *Prothorax* more than twice as wide as the head; sides in the basal two-thirds parallel and distinctly arcuate, slightly constricted near the apex which is broadly arcuate and slightly sinuate in the middle, more than one-half as wide as the base; the latter transversely truncate; disk transversely, strongly convex, two-thirds wider than long, very coarsely, rather densely punctate; scales generally recumbent toward base, erect toward apex; the latter fringed with a dense row of short, very robust, squamiform hairs. *Elytra* at base as wide as the prothorax; sides parallel and nearly straight for two-thirds the length from the base, then gradually rounded; to the apex, which, conjointly, is almost semicircularly rounded; disk cylindrical, nearly one-half longer than wide, two and one-half times as long as the prothorax, elevated along the basal margin, the summit of the elevation being broken into small crests; surface feebly striate; striæ punctate; intervals flat, coarsely, rather sparsely and unevenly punctate; smaller scales usually recumbent; along the middle of each interval there is a row of longer, erect, fuscous scales. Under surface scabrous, black, coarsely punctate. *Legs* piceous; tarsi paler. Length 1.7 mm.

Nevada; (Washoe Co. 1).

The scales of the pronotum are generally entire, but upon the flanks they become narrow, almost hair-like, and are bifurcate from their base, becoming, anteriorly and near the

coxæ, trifurcate. The sparse vestiture of the entire under surface is of this same nature.

The single representative of this interesting species was beaten from the low trees bordering the Truckee River, in early spring, at Reno, Nevada.

Chaetophlæus hystrix Lec., found at San Diego, California, is another singular species and appears to resemble that above described in the structure of the head, but as that species is described as robust and oval, having the surface clothed with erect hair, it is abundantly distinguished from the present which is squamose and nearly cylindrical.

APPENDIX.

NOTES.

I.

The genus *Colusa* is apparently regarded as identical with *Echidnoglossa* Woll. In order to determine if possible the truth in regard to the mutual relationship of these two genera, I have, therefore, made a short comparative study, taking as a basis the careful description of *Echidnoglossa*, given by Wollaston (Cat. Can. Col., p. 530). As this study may be useful in future systematic investigations, it is given below:—

In *Echidnoglossa* the ligula is slender, minutely bifid at apex; the labial palpi are distinctly 3-jointed, the joints subequal in length, the width decreasing. The posterior tarsi have the joints gradually and slightly decreasing in length to the fourth.

In *Colusa* the ligula is elongate, very slender, slightly longer than the terminal joint of the labial palpi and is apparently perfectly simple at apex. The first two joints of the labial palpi are apparently cylindrical, rather short,

equal in diameter and closely connate or anchylosed; in most cases the suture is completely obliterated so that they appear to form but a single joint; the last joint is very long and slender, affixed very obliquely and is generally slightly longer than the first two together. The posterior tarsi are of rather peculiar structure; the first joint is fully as long as, sometimes distinctly longer than the next two together, the latter being equal in length and each distinctly *shorter* than the fourth; the fifth is generally longer than the first.

If the words "*elytris brevissimis*" are to be accepted in their ordinary meaning, the genus of the Atlantic Islands must be remarkably different in appearance, since the elytra in Colusa are unusually long, wide and well developed. In the description of the single species of *Echidnoglossa*, Wollaston states that it is alutaceous, scarcely punctulate, and sparsely pubescent. In Colusa the integuments are not alutaceous but polished, rather densely pubescent and deeply punctate, the elytra very coarsely and conspicuously so.

The two genera are, nevertheless, allied by a very striking character which I have repeatedly verified in Colusa—the pentamerous tarsi—and Colusa is evidently the American representative of the eastern *Echidnoglossa*. I believe that enough has been said, however, to show that they should not be united without a much more careful comparison than has yet been accorded them.

II.

The species described by me under the names *Ilyobates* (Bull. Cal. Acad. Sci. I, p. 307) belong in reality to *Bolitochara*. By an unfortunate oversight the number of joints in the tarsi was recorded erroneously; both these genera possess the strongly elevated mesosternal carina. I am indebted for this rectification to M. A. Fauvel.

III.

Attention is called to a very singular sexual character in a Californian species of *Leptacinus*, a figure of which is given on the plate. The species may possibly be *brunnescens* Lec. The pronotum of this specimen is not foveate at the sides, but another specimen of apparently the same species has a large deep fovea at about the middle of each side of the pronotum and very near the edge; the latter example has the sixth ventral segment simple and broadly rounded at the apex.

IV.

In the classification of the Coleoptera of North America—p. 97—occurs the sentence: “The second ventral segment is marked with two short ridges.” As there is no such structure in our species of *Stenini*, the insertion of this phrase must be the result of an oversight.

V.

Although the synonymical notices recently published by M. Fauvel through Dr. Horn (Proc. Ent. Sec. A. N. S., Phil., June, 1886, p. xiii) relating to several species of *Stenini* described by me may possibly be correct, there is a much greater probability of error. This probability almost amounts to a certainty in the case of *Hemistenus reconditus*, which is not the same as *tarsalis* Ljungh. In order to substantiate this statement I would refer the reader to the outlines of the tarsal claws of the two species, which I have figured on the plate accompanying the Revision.

As for the other synonyms indicated by M. Fauvel, it can only be said that the descriptions of the species mentioned which are given by Erichson and Rey do not agree very satisfactorily with those which I have drawn up as carefully as possible in the Revision of the North American *Stenini* for the corresponding American forms.

In a group where the species are so excessively numerous and closely allied as in the Stenini, great care should be exercised in making synonymical statements, and, it may be added, there are probably extremely few species common to Europe and North America. It is even possible that our familiar *juno* is not the same species as the European *juno*, for the figure of the male sexual characters of this species given by Rey does not correspond, particularly the modification of the fifth segment, which scarcely agrees at all with the description which I have given for the American species.

VI.

PINOPHILI.—The statement made concerning this group (Class. Col. N. A., p. 99), viz, that the species are found under the bark of trees, is erroneous as far as the genus *Pinophilus* is concerned; the correct derivation of the word is given by Erichson (Gen. Staph., p. 670). Of the four species in my cabinet, the two collected by myself were taken in damp earth, under decomposing vegetable matter, and in a few instances under stones; the other two were attracted at night to the electric lights at El Paso, Texas.

VII.

PLATYSTETHUS SPICULUS Er.—Specimens of this species, which was described by Erichson from Colombia, South America, were recently taken at Galveston and Austin, Texas. These specimens correspond with others communicated by Dr. Dugès, taken at Guanajuato, Mexico, showing that the species is of very wide distribution. The name should be added to our lists.

VIII.

AGLENUS Er.—A colony of about forty specimens of a species which is probably *A. brunneus* Gyll., was recently taken by me in the environs of San Francisco. Full de-

tails concerning the locality and other circumstances have been sent to the Entomological Society of Washington.

IX.

The statement of Dr. Horn (Proc. Ent. Sec. A. N. S. Phil.; June, 1886, p. xiii) concerning the identity of *Platycerus Agassii* Lec. and *californicus* Cas. is erroneous. These two species are mutually more dissimilar in outline, punctuation and general appearance than even *oregonensis* and *depressus*. Before describing *californicus* I had access to a very fine series of ten specimens of *Agassii* in the cabinet of Mr. C. Fuchs, a specialist in this family, who had previously written a synopsis of the American species (Bull. Bk. Ent. Soc. V., p. 57). The specimens of this series agree perfectly with Mr. Fuchs' description of the type of *Agassii*, and also with the description recently given by Mr. F. Blanchard (Tr. Am. Ent. Soc., XII. p. 169).

Such absolute and unqualified assertions as the one referred to on the part of Dr. Horn, unaccompanied by any comparative statements and hastily made without examining the type or even an authentic representative of the species condemned, are entirely uncalled for and generally of very little scientific value.

ADDENDUM.

As the present paper was passing through the press, it was found that the specific name *exilis* had already been employed for a species of *Heterothops*, and I therefore substitute the word *occidentis*.

EXPLANATION OF THE PLATE.

- Fig. 1—*Reichenbachia tumorosa* Cas.—Antenna ♂
 Fig. 1a—*R. tumidicornis* Cas.—Antenna ♂
 Fig. 1b—*R. informis* Cas.—Antenna ♂
 Fig. 2—*R. deformata* Lec.—Antenna ♂
 Fig. 2a—*R. fundata* Cas.—Antenna ♂
 Fig. 2b—*R. franciscana* Cas.—Antenna ♂
 Fig. 2—*Eumitocerus tarsalis* Cas.
 3a—Anterior tibia and tarsus.
 3b—Maxillary palpus.
 3c—Posterior coxa.
 Fig. 4—*Leptacinus* sp. incog.—Abdominal vertex showing long rigid sexual spine.
 4a—Lateral view of same.
 Fig. 5—*Hesperobium* Cas.—Base of abdomen beneath, showing structure.
 NOTE—This figure is referred to in the introductory notes of the present paper, p. 159.
 Fig. 6—*Leptogenius brevicornis* Cas.
 6a—Maxillary palpus.
 Fig 7—*Scopæus levigatus* Gyll.—Infralateral view of prothorax showing form of intercoxal lamina.
 7a—Labrum.
 Fig. 8—*Scopæodera nitida* Lec.—Same.
 8a—Labrum.
 Fig. 9—*Leptorus picipes* Cas.—Same.
 9a—Labrum.
 Fig. 10—*Orus punctatus* Cas.—Same.
 10a—Labrum.
 Fig. 11—*Pelecomalium binotatum* Cas.—Labrum.
 11a—Maxillary palpus.
 11b—Posterior tarsus.
 11c—Labial palpus
 Fig. 12—*Lathrimæum humerale* Cas.
 Fig. 13—*Orobatus rufipes* Cas.
 Fig. 14—*O. densus* Cas.
 Fig. 15—*Actidium rotundicollæ* Cas.
 Fig. 16—*Ptilium sulcatum* Cas.
 Fig. 17—*Smicrus americanus* Cas.
 Fig. 18—*Ditaphrus scymnoides* Cas.—Antenna.
 Fig. 19—*Eleates occidentalis* Cas.
 Fig. 20—*Renocis heterodoxus* Cas.
 20a—Slightly oblique side view of head.

SUBMARINE VALLEYS ON THE PACIFIC COAST OF THE
UNITED STATES.

BY GEORGE DAVIDSON,

Read at the Meeting of October 4th, 1886.

(This paper was illustrated with diagrams.)

The plateau of the Pacific Ocean reaches a depth of 2,000 to 2,400 fathoms within as little as forty or fifty miles of the Coast to the southward of Cape Mendocino. The descent to these profound depths is not uniform, however, except off the high range of the Santa Lucia. Generally there is a marginal plateau of ten miles out to the hundred fathom curve, and then the descent is sharp to five or six hundred fathoms. Off the level and shallow plateau of the Gulf of the Farallones, the descent is rapid within five miles of the South East Farallones, and reaches 2,000 fathoms in fifty miles. The determination of these great depths we owe to the deep sea soundings of Commodore Belknap, of which a full discussion was presented by me to the Academy in 1873-4.

Into this marginal plateau of one hundred fathoms there have been developed, in the course of the operations of the United States Coast and Geodetic Survey, several remarkable submarine valleys. Notably that in Monterey Bay, heading to the low lands at the great bend of the Salinas River; and that off Point Hueneme at the eastern entrance to the Santa Barbara Channel, also heading into the low coast at the wide opening of the Santa Clara Valley. Then there are one or two near the mouth of the Laguna Mugu, two or three off the southern point of Carmel Bay, while the deepest one enters far into the Bay. These all have remarkable characteristics which I have heretofore brought to the notice of the Academy.

Submarine Valley I. The latest developments of submarine valleys are near the high, bold coast under Cape Mendocino. A submarine ridge runs southward from Point Delgada at Shelter Cove, in latitude $40^{\circ} 01'$, for ten miles or more. But the depth of the marginal plateau at 100 fathoms is about six or seven miles from the shore. Just north of this bank, off Shelter Cove, there has been developed a deep submarine valley where it breaks through the marginal plateau and runs sharply into the immediate coast-line under the culminating point of the crest-line of mountains. The head of this submarine valley is 100 fathoms deep at one and a quarter miles from the shore, and the depth of 25 fathoms almost reaches to the rocks under the cliffs. The mountain peak toward which it points is 4,236 feet above the sea and only two and a half miles inside the shore line. The 100 fathom line lies six miles off Point Delgada, but where the valley breaks through the marginal plateau the depth reaches 400 fathoms. The slopes of the sides of this valley are very steep.

Submarine Valley II. Hence northwestward to Point Gorda the 100 fathom line of soundings continues nearly parallel with the coast line except about midway, where a minor submarine valley 300 to 150 fathoms deep stretches sharply toward the shore, and within two and a half miles thereof. The head lies two and a half miles south by east from Spanish Flat, under the mountains. But immediately north of the point, there is a very deep submarine valley which comes in from the westsouthwest, and heads close under the shore three miles north of Point Gorda, and therefore less than a mile north of the mouth of the Mattole River.

The head of this great submarine valley, at the 30 fathom line, is only one-third of a mile from the shore in latitude $40^{\circ} 18\frac{1}{2}'$. The depth of 100 fathoms in the valley is only one and a half miles from shore, and the sides of the valley

are remarkably steep. The 100 fathom curve of the valley comes close between the general 30 fathom curve on the north and south, where they are one-third of a mile apart.

The opening of this valley through the edge of the 100 fathom plateau is 520 fathoms deep, and is only six miles S. 62° W. from Point Gorda. The barrier of coast line at the head of this valley is over 2,000 feet high.

Submarine Valley III. Between Point Gorda and Cape Mendocino there is a second submarine valley, a little nearer to the cape. It comes in from the westward, but does not indent the 20 fathom line along the shore, but the depth of 100 fathoms in the valley is only one-third of a mile outside the regular 25 fathom coast line, and lies five miles S. by E. from Cape Mendocino light house.

The 450 fathom sounding in the entrance to the valley is only six and a half miles SW. by S. from the cape, and this valley is comparatively wide. Its north side is formed by a 30 fathom submarine plateau extending five miles from the cape. This valley heads under the great mountain mass, rising behind Cape Mendocino and reaching 3,400 feet elevation.

The bottom of the valley is green mud, and yet in two places, at depths of 320 fathoms, broken shells were brought up with gravel. Both slopes of the valley are green mud up to about 30 or 35 fathoms, when the bottom changes to fine gray sand.

Between the two submarine valleys of Point Gorda (II.) and Cape Mendocino (III.), the submarine ridge carries 50 fathoms out for four and a quarter miles from shore; the bottom is green mud outside of 35 to 40 fathoms, with fine gray sand inside.

Northward of the Cape Mendocino submarine valley, the irregular bottom off Cape Mendocino, marked by Blunt's reef, stretches well to the westward of the usual coast

depths, and is thence spread out towards Humboldt Bay as a broad and comparatively shallow plateau.

Two problems are at once suggested by these submarine valleys. One is eminently practical. Steam coasting vessels bound for Humboldt Bay, when they get as far north as Shelter Cove in very thick fogs, haul into the shore to find soundings, and then continue parallel with the shore. One vessel has been lost by failing to find bottom until close upon the rocky coast. This steamer doubtless sounded up the axis of the deep submarine valley off King Peak, and could find no bottom. Had the existence of this valley been known, the vessel would have proceeded in a more guarded manner.

The second bearing which these great submarine valleys have, is upon the deep sea fauna which must be brought close under the shores, the more especially as they bring in the colder waters coming down the coast outside of the influence of the close inshore eddy current to the northward.

ADDITIONS TO THE ORNITHOLOGY OF GUADALUPE ISLAND

BY WALTER E. BRYANT.

The avifauna of Guadalupe Island was entirely unknown to science until 1875, when Dr. Edward Palmer, in the interest of the U. S. National Museum, made a collection of seventy-two specimens embracing eight species of land birds and one water bird found dead on the island.¹ The results of this work were published by Mr. Robert Ridgway.²

In "The Birds of Guadalupe Island," Mr. Ridgway remarks that "the land birds contained in the collection from Guadalupe embrace only eight species, so that the fauna of the island is by no means fully represented; indeed, the collector observed a humming-bird, two kinds of owls, and a hawk, of which no specimens were obtained. This is to be regretted, since most, if not all, of these would doubtless have proved new. It is altogether likely, too, that other species escaped notice, and thus remain to be discovered; a rich field is therefore left to the future explorer."

I have twice visited in pursuit of ornithological studies this remote island, which is extremely difficult of access. In January, 1885, I spent a brief time on Guadalupe, sufficient time, indeed, to but increase my desire for further investi-

NOTE ¹.—The eight species of land birds were determined to be new to science. The water bird was an adult specimen in breeding plumage of the Pacific Loon (*Urinator pacificus*).

NOTE ².—"Ornithology of Guadeloupe Island, based on notes and collections, made by Dr. Edward Palmer." Bulletin, Hayden's Survey, 1876, No. 2, p. 183.

See, also, Bulletin of the Nuttall Ornithological Club, Vol. II, p. 58, July, 1877.

gation. Through the kindness of Mr. Luis Huller I was enabled at the end of the same year to make a second visit, landing on the island on December 16, 1885. My expectation was to stay about six weeks, but as it eventuated, it was one hundred and twelve days before an opportunity presented itself for me to leave the island. During these three months and a half I had ample time to most thoroughly prospect the island and to make a careful study, not only of the birds themselves but of their habits, number and distribution.

Guadalupe being almost unknown and charts quite unattainable, a few words in the way of description may serve to render more lucid the remarks which follow.

Guadalupe Island is situated about two hundred and twenty miles to the southward and westward of San Diego, the northern extremity lying in about $29^{\circ} 10' N.$, $118^{\circ} 18' W.$ Extending about fifteen miles in length, with a maximum width of five miles, it is said to reach at its highest point an altitude of 4,523 feet. It is of volcanic origin, as is evidenced by the loose, burnt rocks, and broken lava which cover the entire island. Rocks varying in size from the smallest pebble to that of a cocoa nut are thickly strewn about on every hand, while in places, huge boulders and ledges crop out. An unbroken ridge rising to its greatest height in the central portion extends the entire length of the island from north to south, forming a "hog's back." On the western side of this range, the land slopes rapidly towards the ocean, ending in many places in high perpendicular cliffs.

Towards the south the land is somewhat lower, sloping more gradually and ending less abruptly. It is noticeable that the southern part of the island, which is the lowest, is very rocky and barren, no trees growing below the central mesa. Whatever vegetation exists there, consists of stunted alfileria and scattered sagebrush. The western side is broken by two great cañons separated by a barren hill of

reddish rock. The northern portion consists of a very sharp ridge nearly or quite perpendicular on the western face, while on the eastern slope it descends rapidly and hides its surface under a covering of sagebrush.

For convenience of reference, I shall mention the wooded tracts under four distinct heads:—

First—At the northern end of the island is a fast decaying forest of pines, extending within narrow limits along the sharp ridge and down the almost perpendicular western face. Among these pines are to be found a few hardy oaks upon whose branches grow huge acorns, said to be the largest in the world. A few isolated pines are found growing along the ridge nearly to its central portion.

Second—Far down on the northwestern slope is a large grove of cabbage palms.

Third—On the highest part of the island, with the exception of a single peak (Mt. Augusta), is situated a large grove of cypress trees covering an area of a mile or more on the western slope; the eastern side of this forest ends abruptly at the edge of the ridge, below which is a comparatively level table land.

Fourth—On this plateau grows a small cypress grove. Here I had my permanent camp, within half a mile of which were several springs and pools of water. With the exception of one spring here and one or two towards the north, all the waters were more or less strongly alkaline. Whenever rain collected in the rocky basin of the small arroyos, this water was used in preference to the alkali water of the springs.

The vegetation in a wet season, as was the winter of 1885-6, consisted chiefly of the common alfileria, while in places, especially about old goat corrals, dense growth of *malva* had sprung up. Throughout the entire length of the island, there grows in places a small white sagebrush with yellow blossoms. This sagebrush, together with the bark of the cypress trees, serves

in dry years as food for the goats, who numbered, I should judge, about two thousand. In the large cypress grove I saw scarcely a tree that did not bear the marks of their teeth.

The climate of Guadalupe was, at that season of the year, quite cool, in fact the nights were so cold that ice occasionally formed, while frost was of common occurrence. Towards spring the weather moderated considerably, and in the summer, I am told, it is very warm. During many days the north-westerners blew keenly, rising at times almost to a gale. The fogs were very dense, and, driven by high winds, swept over the island, saturating it like rain. Although the rains were at no time very heavy, the sloping and rocky formation of the land allows most of it to flow off, so that a few hours of rain would send small torrents rushing down the arroyos.

The work of preparing specimens was beset with many difficulties. On some days the large blow-flies that swarmed about camp compelled me to prepare and pack in a green condition the specimens as soon as brought in. But more trouble was caused by the dense fogs that often enveloped the camp and so relaxed skins that were not tightly boxed, as to render it necessary to reset them. The accommodations, moreover, were not the most suitable, nor were the comforts of life in excess of the demand for them. As a result of three and a half months' sojourn on the island, the number of known species has been increased by twenty-seven, making a total of thirty-six known to the island.

Four of the straggling species, viz.:—Mountain Bluebird, Varied Thrush, Townsend's Sparrow and Golden-crowned Sparrow, are recorded for the first time from so southern a latitude as Guadalupe Island, while their presence so far off shore, is of scarcely less interest. It is shown quite conclusively that the four species (certainly three of them) that were noted, but not taken in 1875, are not new to science. The very natural supposition to the contrary held by many, served to attract me to the island.

There yet remain unknown the eggs of *Pipilo consobrinus*, *Thryothorus brevicaudus* and *Polyborus lutosus*, and also the young plumage of *Thryothorus brevicaudus*, *Colaptes rufipileus* and *Regulus obscurus*.

From Dr. Palmer's notes I was led to suppose that the breeding season on Guadalupe differed but slightly, if any, from that about the vicinity of San Francisco Bay. Personal observation, however, reveals the fact that on the island it is several months earlier, nesting beginning with many of the species in the winter, as will be seen by the dates accompanying the notes.

The researches made by Mr. L. Belding on the western coast of Lower California, disclose the fact that, as far south as Cerros Island (about 23 deg. north), the birds do not differ from those found near San Diego.

With the exception of a pair of falcons (*F. mexicanus*?), which were not taken, the subjoined is a complete list of the birds which I found inhabiting Guadalupe Island. Nevertheless, there is a strong probability that others have and will find rest in transit, or permanently, as in the case of the cross-bills and nuthatches. Without going into the details of a strict technical treatise, I will endeavor to give a full account of the habits, distribution and numbers of the birds from my personal observation. The measurements have been carefully taken and compared with specimens and published descriptions, those of the more common species being omitted.

The Mexican names of many birds were not known to the inhabitants, and in some instances it was evident that they either confounded the species or applied to a bird the name of some similar bird with which they were familiar. As they may, however, be of use to others who may visit the island, I append the names as they were given me:

- 1.—*Buteo borealis calurus*.—"Aguilia," which more strictly means an eagle.

- 2.—*Tinnunculus sparverius*.—"Gavalancillo."
- 3.—*Polyborus lutosus*.—"Queleli."
- 4.—*Speotyto cunicularia hypogæa*.—"Lechuza."
- 5.—*Colaptes rufipileus*.—"Carpentero." This name is applied to several of the woodpeckers in California, particularly *Melanerpes formicivorus bairdi*.
- 6.—*Micropus melanoleucus*.—"Golondrina." Also applied to swallows in Lower California.
- 7.—*Trochilus anna*.—"Chuparrosa." Humming birds generally.
- 8.—*Carpodacus amplus*.—"Gorrion." Pronounced "Burion," as it is spelled in B. B. & R. Hist. N. Am. Birds. In California *C. frontalis rhodocolpus* is also known by this name.
- 9.—*Junco insularis*.—"Gorrion azul."
- 10.—*Oroscoptes montanus*.—"Sinsontle."
- 11.—*Salpinctes guadeloupensis*.—"Saltapared."
- 12.—*Regulus obscurus*.—"Canaria."
- 13.—*Merula migratoria propinqua*.—"Silguero."

To Mr. H. W. Henshaw, Mr. W. O. Emerson and the authorities of the U. S. National Museum, I am much indebted for the use of specimens with which to compare my own. I also wish to express my thanks to Mr. L. Belding for valuable information and suggestion, and to Capt. L. W. Johnston for his many kind offices during the two voyages which I have made with him. To Mr. John Lehr, the island agent, my thanks are due for his valuable aid during my stay.

The nomenclature and order of the A. O. U. checklist has been followed in the preparation of this paper.

1. *Larus occidentalis*.

WESTERN GULL.—A few single birds were seen off shore alighting on rocks which at high tide were entirely covered. I was told that the gulls had formerly bred in considerable numbers at the southern end of the island, where they were

not so frequently molested by the "Quelelis." The latter, said my informant, had often been seen in the act of robbing the gulls of their eggs. The birds can undoubtedly nest at the present time on any other portion of the shore, especially the northern, where they would be comparatively free from this source of danger. Had more time been at disposal, a trip of a few days along shore might have resulted in the discovery of a breeding colony, although the month of April was rather early to look for gull's eggs.

Specimens in both adult and immature plumage in numbers were noticed about the island, but after getting well out to sea on the return voyage, the schooner was accompanied by a few adult birds only. On approaching the Californian coast, these were joined by a number of others, accompanied by a few birds of immature plumage. Apparently the younger birds are not partial to long flights at sea, with the chances of encountering heavy weather, and therefore prefer to follow the coast-line. If such be the case, the immature birds of Guadalupe may have been reared there, and were loath to put to sea in pursuit of vessels.

2. *Puffinus gavia*.

BLACK-VENTED SHEARWATER.—A decayed specimen, found on top of the island in April, has kindly been identified by Dr. Cooper as this species. One stormy night in January, I heard a bird, as he flew past camp, making a peculiar rasping squawk, and although I subsequently heard the same sound on numerous occasions, more particularly when encamped at a lower altitude, I was yet unable to detect the author of it. My Mexican companion said the bird that made the sound was a "Cuapo," common in Mexico; he also drew in explanation the outline of the bill of some rapacious bird; such information is, of course, extremely unreliable.

Since then I have not found any one who knows of a bird by the name "Cuapo." I was inclined to assign the sounds

to sea-birds, which hypothesis was strengthened by my hearing a far greater number of these night-fliers along the beach than on the top of the island, where the dead one was found. In the afternoon on which I left the island, large flocks of Shearwaters were seen a few miles from shore, all of which were on the wing, not much above the waves. Some or all may have been of this species. As the schooner neared Los Coronados Islands (about twenty miles southwest of San Diego), large flocks were seen on the water but rose long before the boat reached them.

3. *Oceanodroma leucorhoa*.

LEACH'S PETREL.—In the latter part of January, I was encamped for a few days upon a narrow shelf of rock below the top of a steep hillside, which formed a quiet lee where some slight protection could be had against the gale. No ornithological work was possible, and nothing could be done for the three days of the storm's continuance but to hug the camp fire. At midnight of the last day, my companion awakened me to announce that some "little owls" were flying about. Every few minutes a bird would pass the small circle of light or hover for an instant in the glow above the fire, while from the enveloping darkness their calls and replies could be clearly heard. There seemed to be four or five close by, but so quick were they in their movements, with flight as erratic as that of a bat, that I found it impossible to shoot them. The next night, I set a steel trap, but the bait, consisting of a Junco, remained untouched. The birds came about my camp only on the darkest nights or, if any were flying during moonlight, they were entirely silent. After the setting of the moon, however, even though as late as four o'clock in the morning, they would make their appearance with their peculiar call. The note I find hard to describe; perhaps I may best characterize it by saying that they seemed to call hurriedly, "here's-a-letter," "here's-a-letter," and then from the dark-

ness came the reply from another that I supposed to be at rest, "*for you,*" "*for you.*"

Toward the north I often found wings or other fragments of a petrel, and sometimes the entire body with the exception of the head. Of several dozen picked up from the ground but one entire bird was found. Scores of these bodies were found, some of them partially eaten. My Mexican said that this wholesale slaughter was the work of cats, but only one or two of these animals were seen, while decapitated petrels were lying about on all sides.

There were many small holes in the moist hillside opening under boulders and fallen branches. Digging into these holes for a distance of from one to three feet, my search was rewarded by the discovery of petrels and fresh eggs. During the greater part of two days I dug into about eighty burrows, in most of which a single bird was found. In some cases a single egg, never more, laid upon a few pine needles in an enlarged chamber at the extremity of the burrow was disclosed to view on removing the bird. The birds seemed dazed when brought to light, and walked or fluttered helplessly along the ground for a few feet until they sufficiently recovered from their fright to make use of their wings. When tossed into the air they descended lightly and made their way among the tree-trunks and wind-falls, dodging limbs and branches with a quick, bat-like motion. I do not know whether they flew out to sea or found concealment until nightfall, but the latter course seems the more probable.

Seldom did a bird make a sound when seized, but occasionally a cry like that of a bird in distress would escape them. One individual, however, while being unearthed, kept up the peculiar night-call which had so puzzled me about the camp-fire.

Their favorite breeding-ground was on the pine ridge, but nests were found as far south as the small cypress grove. It was very difficult to secure clean specimens since, upon

being caught, they invariably vomited and purged a reddish, thin, oily fluid of an extremely strong odor. The single egg which they lay is held against the abdomen of the sitting bird. It is shaped much like a pigeon's egg, white in color, while one end is wreathed with a fine spattering of minute dots of reddish brown and pale lavender.

The average measurements of fifty eggs taken March 4th and 5th, is 35.7 x 27 mm. The largest eggs measure 37.5 x 27.5; 38 x 27.5; 37 x 28 mm., and the smallest 31.5 x 26; 32.5 x 25.5; ; 33 x 27 mm.

DIMENSIONS OF SPECIMENS.

Collector's No.	Sex and age.	Wing.	Tail feath'rs	Depth of fork.	Exposed culmen.	Tarsus.	Middle toe and claw.
		mm.	mm.	mm.	mm.	mm.	mm.
2555	♂ ad.	155	85	25	17	25	29
2556	♂ ad.	162	92	28	17	23	29
2558	♂ ad.	158	87	23	16	23	28
2559	♂ ad.	161	90	30	16	25	28
2560	♂ ad.	162	93	25	15.5	25	28
2561	♂ ad.	160	89	32	17	24	28
2563	♂ ad.	166	95	—	17	25	29.5
2564	♂ ad.	168	94	32	17	23	30
2566	♂ ad.	162	92	26	16.5	24	29
2567	♂ ad.	166	97	34	17	24	30
2568	♂ ad.	160	92	—	15.5	22.5	28
2557	♂ ad.	171	99	35	16	24	28
2562	♂ ad.	167	97	30	16	22	29
2565	♂ ad.	159	96	35	17	26	30

No. 11,164 in the collection of the Cal. Academy of Sciences, from Atlantic Ocean, measures—Tail, 94 mm.; depth of fork, 18 mm.; culmen, 16 mm.; tarsus, 22.5 mm.; middle toe and claw, 24.5 mm.

No. 11,165 in the collection of the Cal. Academy of Sciences, from Atlantic Ocean, measures—Tail, 92 mm.; depth of fork, 18 mm.; culmen, 16 mm.; tarsus, 22 mm.; middle toe and claw, 25 mm.

There is indicated in the longer tail, greater depth of fork and longer middle toe which is constant in the Guadalupe example, a Pacific or at least a Guadalupe Island form of *Oceanodroma*, differing mainly in these respects from *O. leucorhoa*. But I have not at present sufficient material from the Atlantic Coast to determine this satisfactorily.

4. *Anser albifrons gambeli*.

AMERICAN WHITE-FRONTED GOOSE.—At my first visit on January 14, 1885, I shot a goose, which I have no doubt was of this species. The bird was a solitary individual, found a few hundred yards from the beach, and when shot fell over a cliff and was lost. Although flying well when flushed, it covered but a short distance before alighting. In the vicinity where it was first seen were many signs indicating that the bird had been there for some time, or that a flock had rested there during a migration. The young grass just appearing above the ground furnished sufficient food.

5. *Buteo borealis calurus*.

WESTERN RED-TAIL.—This is a resident species, and is probably the hawk seen by Dr. Palmer, but of which no specimen was obtained. They were not common, not more than three or four being seen during any single day, and probably the same birds were counted over several times in the course of a week. At the time of my departure I estimated their number as about equalling that of the Caracara eagle. They were oftener seen toward the north where the pines offered a high roosting-place. On pleasant days they extended their hunting excursions toward the south, sometimes remaining for days in the vicinity of the small cypress grove, but on the occasion of foggy or rainy weather they disappeared, seeking shelter among the pines, where, perched on branches close to the leeward side of the trunk, they waited storm-bound till hunger or fair weather called them away. Their extreme wariness and the nature of the country prevented me from securing more than a single specimen. This is an adult male, which was taken on the edge of the small cypress grove January 5.

No nests were seen, but I have no doubt that among the scattered pines these birds hatch and rear their young.

DIMENSIONS OF SPECIMEN COLLECTED.

Collector's No.	Sex and age.	Wing.	Tail-feathers.	Bill from nostril	Tarsus.	Middle toe
2403	♂ <i>ad.</i>	mm. 385	mm. 204	mm. 23	mm. 70	mm. 48

Iris, dark brown. Cere, commissure and toes, chrome yellow. Length, 517 mm. Extent, 1249.5 mm.

6. *Falco sparverius*.

AMERICAN SPARROW-HAWK.—During the two days spent on the island in January, 1885, I saw a single pair of these birds, but only succeeded in securing the female. My sojourn during the winter and spring of the following year showed the birds to be a resident species. It was seldom that one could not approach within gun shot, even in open ground, while the bird was sitting perched upon either a boulder or the dead branch of a cypress. They especially frequented the central and higher portions of the island. By the middle of February male and female were seen in company, one pair remaining near some isolated cypress tree, while another pair had evidently taken up their abode in a rocky cliff, the absence of suitable tree-cavities forcing them to adopt some convenient hole in the rocks for a nesting place.

Their means of subsistence, during the time of my observation, consisted of coleoptera, caterpillars and other insects, upon which food they became quite fat. I did not see them in pursuit of small birds, and believe it is not their custom to molest them, at least while insect food can be obtained.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date.	Wing.	Tail feathers.	Bill from nostril.	Tarsus.	Middle toe.
2410	♂	January 21, 1886	mm. 188	mm. 124	mm. 10	mm. 31	mm. 23
2520	♂ <i>ad</i>	February 15, 1886	188	122	11	34	25
2519	♀ <i>ad</i>	February 15, 1886	195	122	11.5	35	23
1687	♀ <i>ad</i>	January 15, 1885	192	125	11.5	36	24

The feet, cere and ophthalmic region, yellow in all four.

No. 2410.—Moulting. Blue of wings almost unspotted. Gizzard contained beetles only.

No. 2520.—Contained insects.

No. 2519.—Very fat. Gizzard contained caterpillars.

7. *Polyborus lutosus*.

GUADALUPE CARACARA.—In January, 1885, during a two days' excursion about the central part of the island, but four "Quelelis" were seen. By 1886 their number had been reduced by more than a score by the island agent, who never missed an opportunity to kill one. Arriving on the island in the summer time, when the birds came to the shallow pools to drink, the agent would lie in wait behind a boulder and pick them off with a rifle. The birds, if missed, heeding not the shot, or, if but slightly wounded, not realizing the danger, remained near, making certain the destruction of all that came to drink at the fatal spring.

During my rambles I frequently came upon the weather-beaten carcasses of "Quelelis" lying where they had fallen. In one place, four were found lying dead together.

In regard to their numbers and destructiveness towards the goats running wild there, the facts noticed by Dr. Palmer in 1875, thoroughly substantiated by information given me by sea-captains and seal-hunters, are not apparent at the present time. Dr. Palmer's assistant, Mr. Harry Stewart of San Diego, writes me that he is unable to say how many were on the island at the time he was there, but that they were in great numbers.

Their range extends over the entire island, from beach to summit. I believe that the killing of several goats each week near the central part of the island, attracted almost the entire number of "Quelelis" to that vicinity,

Being of an unsuspicious character, they will allow a person to walk directly towards them until within shooting distance, merely watching the intruder until the distance becomes less than agreeable. If they happen to be upon the

ground they beat a retreat at an awkward walk or, if necessary, a run, taking wing only as a last resort, and even then flying but a short distance before alighting. Their actions, gait and positions, while on the ground are similar to those of a buzzard. In flight, the light color on the primaries is distinctly shown.

During several consecutive days, a "Queleli" came to my camp, searching for scraps of food. One day I saw him making off, at a walk, from the cook-house, carrying with him a piece of bone from the leg of a goat, and upon which a little raw meat still adhered. With this bone, fully nine inches in length, grasped firmly in his bill, he retired to what he considered a safe distance before commencing his feast.

As far as my observations went, the birds were entirely silent, but the agent informed me that when perchance a rifle ball carried away a wing or a foot, the unfortunate bird would scream long and loudly. If the wounded creature happened to be in company with others of his kind, he would be immediately attacked and killed. One which was badly wounded attempted to escape by running, with the assistance of his wings. Being overtaken and brought to bay, instead of throwing himself on his back in an attitude of defence, or uttering a cry for quarter, he raised his crest and with an air of defiance, calmly awaited death as became the Eagle of Guadalupe. Weakened by the loss of blood which poured from a wound in his throat, he finally fell forward and died—silent and defiant to the last.

If a goat was killed and not immediately taken to camp, the hunter was almost certain to find upon his return that a "Queleli" (rarely more than one) had taken possession of the carcass.

Their food during the season of caterpillars consists almost entirely of these larvæ, with a slight variation afforded by occasional beetles and crickets. Whenever opportunity offers they are ready to gorge themselves upon

the offal of a slain goat, retiring after the banquet to a convenient tree to await the process of digestion. I have never known of their eating the bodies of their own species, but they do not object to making a meal off the flesh of a fat petrel if fortune casts a dead one in their way.

The goats, I believe, are seldom molested in a time of plenty by the few Eagles that remain, although during a scarcity of food, it is not unlikely that they would attack a kid or possibly even a full grown animal. By the latter part of April, the birds had apparently not paired, and I believe the eggs are not laid until the latter part of May or June.

The Mexicans said that a cliff was always chosen for a nesting place, thus making their nests difficult to find and still more difficult of access. This being the case, I fear the eggs will long remain unknown.

LIST OF SPECIMENS.

Collector's No.	Sex and age.	Date.	Wing.	Tail.	Culmen from cere.	Tarsus	Middle toe.
			mm.	mm.	mm.	mm.	mm.
1692	♂ <i>ad.</i>	Jan. 15, 1885	402	260	32	92	51
2387	♂ <i>ad.</i>	Jan. 4, 1886	390	260	33	84	53
2577	♂ <i>ad.</i>	March 16, 1886	399	260	33	88	53
1691	♂ <i>ad.</i>	Jan. 15, 1885	418	276	33	89	53
1699	♂ <i>ad.</i>	Jan. 15, 1885	405	268	33	89	56
2408	♂ <i>ad.</i>	Jan. 8, 1886	412	266	33	90	50
2504	♂ <i>ad.</i>	Feb. 16, 1886	418	285	33	84	54
2581	♂ <i>ad.</i>	March 22, 1886	414	273	33	90	55
2409	♂ <i>im.</i>	Jan. 18, 1886	405	260	32	92	54
2576	♂ <i>im.</i>	March 16, 1886	408	257	32	88	54

Remarks.—The adult birds have light-brown eyes. Bill, pale bluish white. Cere, lores, feet and legs, chrome yellow. The yellow of lores assumes a salmon color soon after death, but this disappears for a short time if a finger is pressed upon the spot, resuming again the salmon color as the skin dries. Immature birds have dark-brown eyes. Bill, light bluish. Lores, not chrome yellow. Feet and legs, nearly "Naples yellow" in color. All of the so-called immature birds which I have seen (five in number) have been in worn or ragged plumage.

No. 1692—Length, 609 mm. One foot missing from below the knee; an old wound.

No. 2387—Length, 603 mm. Extent, 1260.5 mm. Contained feathers and pieces of goat meat.

No. 1691—Length, 631 mm. Extent, 1308 mm.

No. 2581—Fat. Ovaries slightly enlarged. Stomach contained a foot and some feathers of a petrel.

No. 2409—Ovaries very small.

8. *Speotyto cunicularia hypogæa*.

BURROWING OWL.—This species may or may not be one of the two kinds of "*Strigidae*" mentioned in the "Ornithology of Guadeloupe Island," but of which no specimens have ever been taken. It was the only species which I met with, and I have no positive evidence of there being any other owls on the island while I was there, although whenever a favorable night offered itself, I seized the opportunity to watch for nocturnal birds.

The Mexicans said that there was a large Owl ("Teco-lote"), which they had occasionally heard hooting at night, but that it was very rare.

From Dr. Palmer's assistant, I learned that one of the owls which was known to be on the island was a Horned Owl (*Bubo*).

A single pair of Ground Owls were the only ones of this species met with. They frequented the open ground on the central part of the island near the alkali pools, appearing only after dusk. The notes made at the time will perhaps give the best idea of the bird's habits as far as these were observed. The third night on which I had watched for them was unusually calm and quite chilly. The lingering twilight rendered objects still visible through the approaching gloom. Nearing a large boulder beside which I purposed to take my stand for that evening, I suddenly started up one of the very birds of which I was in search. Frightened by my approach, she rose a short distance in front of me, and instead of alighting on a rock, as I expected, and thus keeping me within sight, she dropped behind it, dis-

appearing instantly. As I cautiously circled around the spot, I noticed her head peering out from one side of the boulder, and at once fired. After smoothing out her plumage and placing her upon a rock, I stationed myself against the boulder and gun in hand watched for the male whose call I had heard issuing from the darkness. Soon the call was repeated nearer than before, and the form of an owl rose dark above the horizon not twenty feet away. He discovered my presence just as I threw my gun into position, and giving a cry of alarm, swerved off. He was, however, too late and was soon placed upon the rock beside his mate. They were both very fat, one was gorged with caterpillars, the other contained a single small beetle.

LIST OF SPECIMENS COLLECTED.

Collector's number.	Sex and age.	Date.
2453	♂ <i>ad.</i>	Feb. 2, 1886.
2452	♀ <i>ad.</i>	Feb. 2, 1886.

Iris and feet yellow.

9. *Colaptes rufipileus*.

GUADALUPE FLICKER.—Comparatively speaking, this bird was not rare in the restricted area of the large cypress grove, but apart from this locality less than a dozen were seen. Three specimens were taken among some palms within a short distance from the beach on the eastern side of the island. One only was heard among the pines at the northern portion, and in the vicinity of the large palm grove on the northwestern slope they were occasionally seen.

Of all the species of this family I have ever met with, none have been so tame and unsuspicious or less frightened by the report of a gun. In January I witnessed a peculiar habit not before noticed, I believe, in birds of this genus. A pair of Flickers were perched facing each other upon a

gnarled root about three feet from the ground, their heads within a foot of each other. Suddenly the male, who had been sitting motionless before the female, began a somewhat grotesque performance, which consisted in a rapid bobbing of his head. In this he was immediately followed by the female. This spasmodic bobbing and bowing they repeated alternately a few times, when both stopped as suddenly as they had commenced. After an interval of a few seconds the male began again and was joined by the female. The movement resembled more an upward jerk of the head than a bow.

Approaching on my hands and knees to get a closer view, I could hear a low chuckling sound while these strange actions were in progress. What the outcome of this love-making—for such I regarded it—would have been I did not ascertain. The fear of losing the specimens—almost the first I had seen—prompted me to fire. The first shot brought down the female. At the report away flew the male, followed by another male, which, unseen by me, had been quite near, on the ground. They returned while I was still holding the female, and thus gave me an opportunity of securing them both. Their evident lack of timidity permitted me to draw near enough to plainly distinguish the characteristic bright red cheek-patches. In February I saw a repetition of the action above noted, the birds being in a cypress tree above me. They were very tame, especially the female, who came quite near as I lay upon the ground, whistling “quíit-tu,” “quíit-tu,” and watching her puzzled actions. In a half-dead cypress this pair had partially pecked a cavity for a nest.

In addition to the familiar scythe-whetting notes they have the peculiar “wake-up” call and its rapid prelude of monosyllables. By imitating this call I decoyed a distant female to within short range, the bird coming through the thickest of the cypress grove, stopping at short intervals to call and listen for a reply.

The food of this species during a portion of the year consists largely of smooth-skinned caterpillars, besides numerous beetles and ants; the latter are always obtainable and growing to a large size figure as an important item of their diet. The scarcity of decayed trees with the exception of fallen ones, necessitates either work upon seasoned wood or the resort to dead palm stumps. The nests will therefore be found at heights varying from three to fifteen feet.

By March 16, the birds were invariably found in pairs, and my wish to secure a setting of eggs before departing seemed in a fair way of being fulfilled. Strolling among the cypress on the 27th of March, I found four trees upon which the birds were at work or had been recently, and in such cases the birds themselves were always to be found in the immediate vicinity. Passing a half-dead tree I heard the sounding taps of a woodpecker at work, and as I neared the spot, the slight noise which I made as I carefully picked my way over the rock-strewn ground caused a handsome male bird to suddenly appear at an opening about four feet high. With a foot grasping either side of the entrance he gazed upon the intruder. Having comprehended the situation, he flew to another tree, where he quietly awaited my inspection and departure. The hole was then down about fifteen inches. By April 7, it had reached a depth of about twenty inches and contained six fresh eggs, upon which the female was then sitting. As no description has hitherto appeared of the eggs of this species it may be well to present here the measurements of this set. (No. 803, author's oölogical collection.) They correspond exactly, both in color and general shape, with scores of other eggs of this genus, and offer the following measurements in millimeters: 28x22; 28x22; 28x22.5; 29x22; 29.5x22; 29.5x22.

A comparison of the measurements of the specimens taken on Guadalupe Island with those of the same genus which I have in my possession may be of interest.

Although on the one hand the collection from the island

is probably the largest that has been obtained, yet on the other hand my series of the other form is not as full as could be desired, and furthermore I possess neither specimen nor description of the recently added variety *saturator*. In the late revision of the nomenclature of North American birds, the variety *hybridus* was rejected. It seemed improbable that the wide departures from typical examples of either *auratus* or *cafer* could be attributed to hybridism. This fact impressed itself more and more on my mind by the ever-increasing occurrence of the so-called Hybrid Flicker. Specimens of this genus, however, are found which no stretch of the imagination can reconcile with any existing description of *auratus*, *cafer* or *rufipileus*, and I have no doubt that similar departures may be found in specimens of *chrysoides* and *saturator*.

DIMENSIONS OF ♂ *ad.* C. RUFIPILEUS.

Collector's No.	Date. 1886.	Wing.	Tail.	Tail-feathers	Bill from nostril.
		mm.	mm.	mm.	mm.
2405	Jan. 8.	146	127	110	34
2406	Jan. 8.	149	123	112	32
2460	Feb. 2.	148	120	116	33
2509	Feb. 12.	145	126	116	32
2511	Feb. 12.	147	124	111	34
2514	Feb. 12.	150	122	108	30
2521	Feb. 15.	152	129	109	36.5
2522	Feb. 15.	145	125	108	34
2524	Feb. 19.	147	123	108	35
2525	Feb. 19.	146	128	114	36
Average..	.....	144.5	124.7	111.2	33.5

No 2406.—Length 312 mm. Extent, 499 mm.

No. 2460.—Stomach gorged with large black ants.

DIMENSION OF ♀ *ad.* *C. RUFIPILEUS.*

Collector's No.	Date. 1886.	Wing.	Tail.	Tail-feathers.	Bill from nostril.
		mm.	mm.	mm.	mm.
2380	Jan. 2.	149	126	111	29
2381	Jan. 4.	146	120	108	32.5
2407	Jan. 8.	143	119	104	33
2526	Jan. 23.	148	123	108	36
2427	Jan. 23.	148	125	110	31
2512	Feb. 12.	154	129	115	34
2513	Feb. 12.	148	124	109	32
2515	Feb. 12.	141	117	104	34
2516	Feb. 12.	146	120	107	33
2527	Feb. 19.	143	125	109	30
Average...	.....	146.6	122.8	108.5	32.4

No. 2380.—Length 328.8 mm. Extent 487 mm. Iris dark reddish-brown.

No. 2381.—Length 312 mm. Extent 476 mm.

No. 2427.—Ovaries small.

COLAPTES CAFER ♀ *ad.*

Collector's No.	Collector's Name.	Locality.	Date.	Bill from nostril.
				mm.
169	W. E. Bryant.	Berkeley, Cal.	Jan. 22, 1881.	31
564	" "	Oakland, Cal.	Feb. 25, 1882.	32
599	" "	Mt. Diablo, Cal.	Apr. 1, 1882.	32.5
772	" "	Oakland, Cal.	Feb. 22, 1883.	30
1065	D. S. Bryant.	Mt. Diablo, Cal.	May 5, 1878.	31
1095	" "	Oakland, Cal.	Mar. 27, 1879.	31
1175	" "	Lafayette, Cal.	Mar. 20, 1883.	30
1742	W. E. Bryant.	Oakland, Cal.	Jan. 25, 1885.	32
1985	" "	" "	Mar. 12, 1885.	31.5
2636	" "	Scott, Cal.	May 28, 1883.	29
Average...	.....	.....	.....	31

No. 564.—Cheek-patches indistinct.

No. 599.—Tail pinkish; crown, light tawny-brown.

No. 1065.—One outer tail-feather yellow.

No. 1095.—Narrow, red nuchal crescent.

No. 1175.—Forehead brown.

No. 1742.—Crown rufous brown.

No. 2636.—Tail red; one outer feather yellow. Anterior portion of crown tawny-brown. Caught on nest containing seven eggs.

COLAPTES CAFER ♂ ad.

Collector's No.	Collector's Name.	Location.	Date.	Bill from nostril.
980	D. S. Bryant.	Oakland, Cal.	Nov. 18, 1877.	33
1006	D. S. Bryant.	Gilroy, Cal.	Dec. 28, 1877.	34

By an inspection of the preceding tables, it will be seen that the long bill is by no means a constant difference. While the length will *average* greater in *rufipileus*, specimens are found with the bill shorter than the average of *cafer*. The two examples of *cafer* given in comparison with *rufipileus* in the "Ornithology of Guadeloupe Island" were from Washington Territory, and under the present arrangement, I presume would be classed as *saturation*, rather than as "true Mexicanus" (*cafer*).

As yet I have seen no description of the male plumage of the Guadeloupe Flicker, but I am informed that one is soon to be published.

Some of the specific characteristics which serve to distinguish this insular species from the continental form, *cafer*, will be briefly noticed.

In the majority of the specimens before me, the characteristic of the more pinkish tinge to the rump and upper tail coverts—especially the latter—seems to hold good. But in some individuals these parts are whiter than will be found in certain specimens of *cafer*. By raising the upper tail coverts and viewing them from the under side, the depth of the coloring may be best determined. This is of a sulphurous tinge in *auratus*.

The bright tawny forehead is usually brighter in the males, and extends farther back on the neck. No specimens of *cafer*, which I have examined, are as richly marked as the most typical examples of *rufipileus*, but individuals of the latter sometimes possess less of the tawny brown than extreme cases among *cafer*.

I have found but two exceptions to the extent of black on the ends of the retrices. One in the case of a female *rufipileus*, in which the black reaches only about 38 mm. from the ends of the feathers, and the other a female *cafer* (formerly *hybridus*) in which the black extends about 57 mm. In typical *rufipileus*, the black covered about 63 mm. of the ends. This I found to be the most constant difference.

The absence in every case of a definite or clearly defined cheek-patch in the females, and also the absence of marginal light spots on the outer web of the exterior retrices in both sexes, will aid in determining this species. These spots, although rarely if ever wanting in typical *cafer* are seldom or never found in *rufipileus*. An apparent exception is found in a male from Guadeloupe Island, which has a slight touch of light on the webs.

10. *Micropus melanoleucus*.

WHITE-THROATED SWIFT.—On January 12, a flock of about fifty swifts passed near camp, moving towards the north-east. They flew in every direction, but kept well together, and gradually ascended to a higher altitude. I could not get near enough to distinguish any characteristic markings. They were again seen during a few hours of sunshine on the 15th, but only at a distance.

A storm of wind, rain and dense fog, which had lasted almost without interruption for twelve days, cleared away January 21, and with the welcome and returning sunshine came the swifts. They were flying lower than usual, and occasionally one would chatter as he swept above the tree-tops. The birds were feeding upon a species of slender black fly, with which the air was swarming, and although dispersed for a time by the report of a gun, they soon returned to their feast. As late as April, they were still on the island, but only a few at a time were seen, the flock having evidently separated, although not apparently paired off. One calm day, about a dozen birds were seen skimming low over the grass in the manner of swallows. As far as my ob-

servations go, this is something unusual for this species, which usually descends towards the earth only in dull, rainy weather in pursuit of insects driven lower by the humid atmosphere. If the birds were to remain on the island during the summer, they could find an abundance of suitable nesting places in the cliffs, either on the shore or on the side of the table-land where the small cypress grove stands.

LIST OF SPECIMENS.

Collector's number.	Sex and age.	Date.
2411	♀ <i>ad.</i>	Jan. 21, 1886.
2584	♀ <i>ad.</i>	March 26, 1884.

2584.—Ovaries, small.

11. *Trochilus anna*.

ANNA'S HUMMING-BIRD.—This diminutive straggler is no doubt the species seen by Dr. Palmer eleven years ago, but of which he did not succeed in obtaining a specimen. I had been in hopes of finding in this bird a new species of hummer. When the month of March arrived and I had not even caught a glimpse of the bird, although on one or two occasions I had heard it buzz as it went past, my hopes of securing this unidentified species were almost gone, and I fully resolved to shoot on sight the first I saw. Returning one day to my temporary camp from an excursion through the pine belt, both barrels of my gun loaded with round ball ($1\frac{1}{8}$ oz.), I stopped at the foot of a fallen pine, intent upon watching a small band of goats, when suddenly my Mexican companion seized my arm and whispered: "la chuparrosa, señor." Following with my eyes the direction indicated by his outstretched hand, I saw a female hummer upon a dead twig among the pine branches, pluming herself. The feelings I experienced some years ago in meeting a panther, at dusk, in a wooded cañon when my gun was

loaded for quail, were not dissimilar to those which now came over me as I gazed upon the coveted hummer not fifteen feet away, and realized that my gun contained ball.

As I broke open the breech and dropped the provoking loads, the bird rose and hovering about for a few seconds, during which I reloaded and waited in a fever of suspense, she returned to nearly the same spot, when I fired and killed—only an Anna humming-bird. Later I took another female, and afterwards a male, the two latter being found in the small cypress grove. The dearth of honied flowers must at times force them to subsist almost entirely upon insect food. The Mexicans told me that I would find them in great numbers about the palm trees on the northwestern slope; but an expedition to that region resulted in a total failure as far as the object for which it was undertaken was concerned, although the addition of two more straggling species to those already taken compensated me for the fatigue of the journey.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date. 1886.
2588	♂ <i>ad.</i>	March 29.
2531	♀ <i>ad.</i>	March 4.
2582	♀ <i>ad.</i>	March 22.

12. *Sturnella magna neglecta*.

WESTERN MEADOW LARK.—A single specimen was seen in the palm grove on the 22d day of March. Although I approached quite near as he sat, loudly singing from the top branch of a fallen pine, I failed to capture him. That unsuccessful shot, one of the “unaccountables” of a hunter-naturalist’s experiences, seemed at the time to be one of the keenest disappointments of my life.

13. *Carpodacus amplus*.

GUADALUPE HOUSE FINCH.—When I arrived at the island

in January, 1885, a few birds, usually in pairs, were found near the settlement. At the door of one of the huts, hanging in a cage, were several of this species, one of which, an adult male, had assumed the yellow plumage which others of this genus take on when confined.

Soon after settling on the top of the island in December, 1885, the "Gorrions" began to collect about the camp, making the mornings joyous with their song.

By our refraining from discharging fire-arms in the immediate vicinity of the camp, they soon became quite tame, hopping about camp during the day, and roosting at night in the thickest cypress, or, during a storm, under the eaves of the palm-thatched huts. On the 24th of January I counted fourteen within a stone's throw of camp, and attracted by the bread crumbs and other food which I threw out for them, their numbers daily increased until on the 1st of February the census of birds in camp, including both sexes, showed a total of twenty-two. Two weeks later they suddenly departed, and were to be found only in pairs about the cypress groves, save in the center of the pine belt, where the blossoms and seeds of the "chick-weed" sometimes attracted a flock of half a dozen, who busied themselves feasting upon this tender food. Nothing, either in their habits or song, differed from *C. frontalis rhodocolpus*.

They are easily entrapped under a box, and it was in this way that the Mexican women at the settlement succeeded in catching, during my stay, as many as two or three dozen, which they ate.

The dissection of specimens showed the food to consist chiefly of seeds from the cypress tree, mingled with green seeds of "chick-weed." Some of those taken near camp had their crops well filled with bits of tallow picked from the body of a goat which had been dressed and hung under a tree.

Two nests were found in cypress trees nearly completed by February 22. A nest and set of five fresh eggs (No. 792,

author's oölogical collection), which in consequence of a heavy storm had been deserted, was taken on the 1st of March. From this date began the nesting season of this species.

The last nest, taken April 7th, contained five eggs, with small embryos in them. In nearly every instance, the birds selected for a nesting place the upper side of a cypress branch in the angle formed by its intersection with the trunk, thus avoiding the storm-shaken foliage. They seemed to show a preference for the leeward side of a tree, where the nest would be protected from prevailing winds. One prudent couple had built in a clump of mistletoe, at a height of twenty feet.

Several pairs built in the tops of palms. The nests were ordinarily not more than ten or fifteen feet from the ground.

The birds make but slight demonstrations while their nest is being removed, uttering only a few notes of protest, or silently witnessing a wrong hitherto unknown to them.

The material used for the outer structure of the nests consisted of the dark, dead stems of weeds, only the finer ones being selected. One nest found in a pine tree, had the foundation and sides made of pine needles, with the invariable lining of goat's hair, black or white being used indiscriminately. The external diameter of the nest is about 130 mm., with a central cavity of about 65 mm.

The eggs, sometimes four in number, but oftener five during the early part of the season, are colored precisely like the average specimens of *C. frontalis rhodocolpus*, the spots being either sparingly applied or entirely wanting. They also resemble them in general shape, but the size serves to distinguish them. The five eggs of set No. 792, measure respectively 22 x 15; 22 x 15.5; 22.5 x 15.5; 23 x 15.5; 23 x 16.5 mm. The length measurement varies from 19.5-24 mm., and the width 15-16.5 mm. The average of thirty-two specimens is 21.3 x 15.5 mm.

In the table of measurements, I have selected from a good

series, those which exhibit extreme size, more or less, as well as average specimens.

DIMENSIONS OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date.	Wing.	Tail-feathers	Bill from nostril.	Depth of bill.	Breadth of bill.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.	mm.
1682	♂ <i>ad.</i>	Jan. 15, 1885.	83	65	11	12	9	19	18
1688	♂ <i>ad.</i>	Jan. 15, 1885.	81	63	10.5	12	9	20	16
2376	♂ <i>ad.</i>	Jan. 2, 1886.	82	64	10.5	12	9.5	19.5	16
2377	♂ <i>ad.</i>	Jan. 2, 1886.	80	63	11	12	9	19.5	17
2465	♂ <i>ad.</i>	Feb. 16, 1886.	82	62	10.5	11	9	19	16
2469	♂ <i>ad.</i>	Feb. 16, 1886.	83	65	11	11	8.5	19.5	16
2544	♂ <i>ad.</i>	Mar. 4, 1886.	84	63	10	11.5	9	19	15
2545	♂ <i>im.</i>	Mar. 4, 1886.	80	62	11	11	9	19	17
2549	♂ <i>ad.</i>	Mar. 4, 1886.	79	61	10	10	8	18	16
2550	♂ <i>ad.</i>	Mar. 4, 1886.	81	63	11	12	9	19	16
Average	age....	.....	81.5	63.1	10.6	11.4	8.9	19.1	16.6

No. 2376.—Testes very small. Length 174 mm. Extent 266 mm.

No. 2377.—Length 171 mm. Extent 263 mm.

Collector's No.	Sex and age.	Date.	Wing.	Tail feathers.	Bill from nostril.	Depth of bill.	Breadth of bill.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.	mm.
1681	♀ <i>ad.</i>	Jan. 15, 1885	82	62	11	11	9	20	17
1686	♀ <i>ad.</i>	Jan. 15, 1885	80	62	10	11	9	19	17
2689	♀ <i>ad.</i>	Jan. 15, 1885	72	62	10	11	9	19	16
2378	♀ <i>ad.</i>	Jan. 2, 1886	79	60.5	10.5	11	8.5	18.5	17
2660	♀ <i>ad.</i>	Feb. 16, 1886	79	63	10	10	9	18	16
2420	♀ <i>ad.</i>	Jan. 23, 1886	78	57	10	11	9	18	16
2472	♀ <i>ad.</i>	Feb. 16, 1886	79	61	10	11	9	19	17
2551	♀ <i>ad.</i>	March 4, 1886	72	59	10.5	12	8.5	19	17
2552	♀ <i>ad.</i>	March 4, 1886	79	59	11	11	9	19	17
2553	♀ <i>ad.</i>	March 4, 1886	79	60	11	11	9	19	16
Average	.....	.....	77.9	60.5	10.4	11	8.9	18.8	16.6

No. 2378.—Ovaries very small. Length, 167.5 mm. Extent, 258 mm.

14. *Loxia curvirostra stricklandi*.

MEXICAN CROSSBILL.—This species, found only through the narrow pine belt, I estimated to number about a score. They remained high up in the pines, flying hurriedly among the tree tops, uttering what seemed to me a frightened note. Occasionally a pair, seldom a single bird, would be seen on the top of a fallen tree, but never upon the ground. The only food which dissection proved them to have been feeding upon, was pine seeds. No nests were found, although several were no doubt being built, if not already completed by the middle of February. A comparison of the island cross-bill with typical examples of *minor* and *stricklandi*, shows it to belong to the latter variety, although the upper mandible is nearly or quite one-third thicker than the lower.

If we assign all Eastern birds to *minor* and Western ones to *stricklandi*, an exception must be made of No. 78,186, which in the Smithsonian Institution is labeled *minor*, although it came from Santa Cruz, California.

“The diversity in general size, size and shape of bill, and color which they present is enough to convince any one that these characters are subject to a wide range of variation and are not dependent, except within broad limits, on geographical considerations. * * * * * It seems obvious that the variations just referred to are either purely individual or dependent on age.”³

In the following tabulated measurements, the length of the exposed culmen is given on account of having been oftener measured, although it is more difficult to determine accurately than the distance from nostril, which is also included. The bill is found curving to the right as often as to the left.

NOTE ³—William Brewster in Auk. Vol. VIII. No. 2. p. 261.

LIST OF SPECIMENS COLLECTED.

Col- lect'r's No.	Sex and age.	Date. 1886.	Wing.	Tail feathers	Ex- posed culmen.	Bill from nostril.	Depth of bill at base.	Tar- sus.	Mid- dle toe & claw.
			mm.	mm.	mm.	mm.	mm.	mm.	mm.
2474	♂ <i>ad</i>	Feb. 16.	93	54.5	16	14	10	16.5	20
2475	♂ <i>ad.</i>	" "	87	51	15	13	9	14	19
2476	♂ <i>ad.</i>	" "	100	60	18	16	11	17	20
2480	♂ <i>im.</i>	" "	88.5	53	15	14	10	14.5	19.5
2481	♂ <i>ad.</i>	" "	88	52.5	17.5	15	10.5	16	19.5
		Average...	91.3	52.2	16.3	14.4	10.1	15.6	19.6
2477	♀ <i>ad.</i>	Feb. 16.	87	52	15	13.5	9	14	19
2478	♀ <i>ad.</i>	" "	84	52	16	14	9	14	18
2479	♀ <i>ad.</i>	" "	90	52	16	14.5	10.5	16	22
2554	♀ <i>ad.</i>	March 4.	90	52	17	15	9.5	17	20
		Average...	87.7	52	16	14.2	9.5	15.2	19.7

LOXIA CURVIROSTRA STRICKLANDI.

Col- lec- tr's No.	Sex and age.	Collector	Locality.	Wing	Tail feath- ers.	Ex- posed cul- men.	Bill from nos- tril.	Depth of bill at base.	Tar- sus.	Mid- dle toe & claw	Date.
				mm.	mm.	mm.	mm.	mm.	mm.	mm.	
705	♂ <i>ad</i>	C.E. Aiken	White Mts., Ar	100	60	19	16.5	11	18	21	Sep. 30, '76
....	♂ <i>im</i>	L. Locke.	Olema, Cal.	85	51	15	13	8	14.5	21	.....

The first is in collection of H. W. Henshaw, the second in collection of W. O. Emerson.

15. *Zonotrichia coronata*.

GOLDEN-CROWNED SPARROW.—Three birds of this species were found feeding upon "chick-weed" amongst the pines.

LIST OF SPECIMENS COLLECTED.

Collector's Number.	Sex and age.	Date, 1886.	Remarks.
2502	♀ <i>im.</i>	Feb. 16.	
2503	♀ <i>im.</i>	Feb. 16.	
2532	♀ <i>im.</i>	March 4.	Moulting.

16. *Spizella socialis arizonæ*.

WESTERN CHIPPING SPARROW.—Returning to camp one noon, I heard the song-note of this species, and was fortunate enough to secure it. No others were known to be on the island.

In accordance with the division of *S. socialis* into Eastern and Western forms, this single specimen, taken on Guadalupe Island, would have to be assigned to the variety *arizonæ*, but in point of fact it will not answer to the original description (Coue's Key, 1872, p. 143), wherein no measurements are given. A later description, however (B. B. & R. Hist. N. Am. B., 1874, Vol. II, p. 11), may be made applicable to the case of western birds which I have seen from this State by omitting from the original description: "black frontlet lacking, and no definite ashy superciliary line, the sides of the crown merely lighter brown; bill brown, pale below."

Excepting the bill, which is "brown, pale below," in this instance, the measurements fall within the limitations of *arizonæ*.

DIMENSIONS OF SPECIMENS.

Collector's No.	Sex and age	Date.	Wing.	Tail.	Tail feathers.	Bill from nostril.	Tarsus.	Middle toe and claw.	Length.	Extent.
2394.	♂	Jan. 6, 1886.	mm. 72	mm. 64	mm. 60	mm. 6	mm. 18	mm. 15	mm. 147.5	mm. 231.5

17. *Junco hyemalis oregonus*.

OREGON JUNCO.—One bird, which was quite shy, was taken among the pines on a cold, windy day, during which the tops of the trees and part of the timber belt were at times entirely enveloped by fog. When first seen this bird was being viciously attacked by a resident junco (*insularis*).

DIMENSIONS OF SPECIMEN.

Collector's No.	Sex and age.	Date.	Wing.	Tail feathers.	Bill from nostril.	Tarsus.	Middle toe.
2489	(?) ♂ <i>ad.</i>	Feb. 16, 1886	mm. 71	mm. 62	mm. 7.5	mm. 20	mm. 16

Remarks—The wing and tail are both a trifle shorter than specimens from Oakland (3) and Big Trees, Cal., (1), but no more than might be expected in individual variation.

18. *Junco insularis*.

GUADALUPE JUNCO.—In his notes, Dr. Palmer refers to this species as “the most abundant birds of the island,” etc. According to my observation they rank about third in relative abundance, the rock-wrens and linnets taking precedence. No juncos were found at a lower altitude than the palm grove, and the majority were inhabitants of the pines and large cypress grove. A pair which was evidently mated was taken in the small cypress grove on the 15th of January, 1885. The following year not more than two or three were seen in this locality.

I did not find them noticeably tamer than the linnets, nor so confiding as the rock-wrens. Their food was principally of seeds, a partiality being shown for the green seeds of the “wild lettuce.” Their song was twice heard from the top of tall cypress trees. It resembles somewhat the trill of the chipping sparrow. They also had a sharp chipping note when alarmed. They remained mostly either upon the ground or low down in the branches of trees. The limbs of a fallen pine were a favorite resort at all times, and the ground underneath most used as a nesting-place.

The Blue “Gorriions” mated early—soon after the beginning of the year—and were setting by the 26th of January, regardless of the almost continuous fogs and winds. A nest found March 10 contained four young, hatched but a few days before. It was placed in a depression, flush with

the surface of the ground, and so carefully hidden beneath a covering of brush that it was found with difficulty, even though I was guided by hearing the young "peeping" for food. The parent birds, who were close by, seemed but little alarmed, uttering only an occasional chirp while I searched for their treasure. Six days later the nest was vacant, being probably robbed by a stray cat.

Full fledged young were taken March 16; also a nest with three fresh eggs, which had been found nearly completed on the 10th. The position of the nest was curious and unique, and it was only by seeing the birds at work building that I succeeded in discovering it. A pine tree with a cleft six feet from the ground, or rather two trees with a common trunk, grew near to the edge of a precipice, and in this narrow cleft partially filled with pine needles the juncos had built. By standing on a pile of rocks and branches I could see the eggs lying in the nest, about a foot below where the trees joined. A fluff of cotton pushed down on the end of a stick to cover the nest, protected the eggs from bits of bark and chips, while I enlarged the opening to a sufficient size to admit my hand. While the eggs were being carefully placed in a collecting box, the birds, who had remained interested rather than alarmed witnesses to the spoliation, flew to the tree, and, while the male clung to the bark at the entrance, the female hopped down within and began the removal of the débris which had fallen upon the edge of the nest. This was at length cleared away by repeated trips into the hole, each journey bringing to the opening a bit of wood, which was promptly dropped to the ground. The nest is composed of a few pieces of bark-moss, light-colored dry grass blades, and a tail feather of a petrel, all surrounding a quantity of grass blades, lined within with goat hair. It measures externally about 120 mm. in diameter by 80 mm. in height, with a receptacle 60 mm. in diameter and only 28 mm. in depth.

The three eggs which the nest contained (set No. 797,

author's oölogical collection) were probably a second setting, the ragged appearance of the female's plumage indicating previous cares. In color the eggs are a pale greenish white, marked with fine dots of reddish brown clustered around the larger end. They measure 19.5x15; 20x15.5; 20x16 millimeters.

MEASUREMENTS OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date.	Wing.	Tail feathers.	Bill from nostril.	Depth of bill.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.
1683	♂ ad.	Jan. 15, 1885.	71	61	9.5	7	20	15
2375	♂ ad.	Jan. 2, 1886.	70	62.5	9.5	6	20	15
2385	♂ ad.	Jan. 4, 1886.	70.5	64	9.5	6.5	20	15.5
2418	♂ ad.	Jan. 23, 1886.	65	57	9.5	6.5	19.5	15.5
2431	♂ ad.	Jan. 26, 1886.	70	60	9.	7	19.5	16
2434	♂ ad.	Jan. 26, 1886.	65	59	9.	6.5	20	14
2442	♂ ad.	Jan. 29, 1886.	68	57	9.5	6.5	19.5	15
2458	♂ ad.	Feb. 4, 1886.	69.5	60.5	10.	6.5	20	15
2537	♂ ad.	March 4, 1886.	68	60	8.5	6.5	19	15
2575	♂ ad.	March 16, 1886.	71	62	10.	7	19	15
Average.....			68.8	60.3	9.4	6.6	19.6	15.1
1684	♀ ad.	Jan. 15, 1885.	65	56	9.	7	20	15
2432	♀ ad.	Jan. 26, 1886.	64	55	9.	6	20	14.5
2574	♀ ad.	March 16, 1886.	62	54	8.5	6	19	15
Average.....			63.6	55	8.8	6.3	19.6	14.8

No. 2375.—Testes large; length, 155 mm.; extent, 223 mm.

No. 2385.—Length, 162 mm.; extent, 230 mm.

No. 2431.—Testes very large; mate of No. 2432.

No. 2458.—Testes very large.

No. 2432.—Setting; mate of No. 2431; parents of nest No. 797.

19. *Melospiza lincolni*.

LINCOLN'S SPARROW.—The small cypress grove, on the border of which I had my permanent camp, was my favorite ground for observation and furnished me with many stragglers, among which was a pair of these birds. They were taken on different days from among the brush inclosing

an old goat corral. The slightest noise would drive them into the dense brush, from which they would again appear when all was quiet.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date, 1886.	Remarks.
2461	♂ <i>ad.</i>	February 5.	Testes small.
2523	♀ <i>ad.</i>	February 19.	Ovaries small.

20. *Passerella iliaca unalaschensis*.

TOWNSEND'S SPARROW.—One bird was taken among the pines, but so badly cut by the shot that the sex could not be determined. No others were seen.

DATA OF SPECIMEN COLLECTED.

Collector's Number.	Age.	When Collected.
2490	♀ <i>ad.</i>	Feb. 16, 1886.

21. *Pipilo consobrinus*.

GUADALUPE TOWHEE.—The towhees were found only in the large cypress grove. They were easily overlooked unless directly in one's path among the trees. When singing the bird could be readily traced and secured, but in such cases it was always a male. Only two females were seen, and I cannot believe that their number was in any degree equal to that of the males, for otherwise I do not believe it possible that I could have so completely overlooked them, even though they might have been setting. I was about the grove at all hours of the day, camped there, and was astir at break of dawn, even before the male towhee had mounted his throne on the topmost branch of a cypress and had sounded his morning trill. This song closely resembles that of *P. maculatus megalonyx*, but has one important

variation which was almost invariably given, and which I have never heard from *megalonyx*. This consists in a single quick note, somewhat like a bluebird's, given immediately before the trill, as though it was the click or chuck of the machinery that released the sound which followed. At a distance, when the trill could be distinctly heard, the single quick chuck would pass unnoticed. When I first heard this combination it occurred to me that a bluebird was in the same tree or near by, but closer observation proved the Towhee to be the sole author of it.

The only food upon which they fed consisted of insects. A young bird in company with the adult pair was found in a fallen cypress top, but no eggs of this species were taken.

Ch.—Young (first plumage). Above rusty olive brown, darker on sides of head. Feathers of interscapular region black, edged, more broadly on the outer web, with pale brown. Underparts yellowish brown, darkest on throat, grading into white on the abdomen and to light reddish brown on side; the feather streaked with black. Sides of chin, black, leaving a light line of about the same width between. White markings on wings and visible edges of greater wing coverts narrowly edged with rusty brown. Eyes muddy brown.

(No. 2585. Author's collection, Guadalupe Island, March 26, 1886.)

Wing, 80 mm; Tail feathers, 71 mm.; Bill from nostril, 7.5 mm.; Tarsus, 23 mm.; middle toe, 20 mm.; hind claw, 12 mm.

It much resembles on the back the young plumage of the same age of *P. maculatus oregonus* (No. 983. Author's collection, Wilbur, Or., June 20, 1883), but the latter is darker on sides of neck, and has the feathers of sides and crissum rich reddish-brown.

The underparts correspond closely to the young of *P. maculatus megalonyx* (No. 2298, author's collection, Oakland, Cal., June 3, 1885), which is somewhat younger. I believe

if they were of the same age it would be impossible to separate them.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age	When collected, 1886	Wing	Tail feathers	Tail	Bill from nostril	Depth of bill	Breadth of bill	Tarsus	Middle toe	Hind claw
			mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
2419	♂ ad.	Jan. 23	80	86	97	9	9	7	26	18	13
2459	♂ ad.	Feb. 2	78	81	88	9.5	9	7	26	18	13
2506	♂ ad.	Feb. 12	78	85	93	9	9	7.5	25	19	14
2507	♂ ad.	Feb. 12	80	86	94	9.5	9	7	26	18	12
2508	♂ ad.	Feb. 12	80	88	96	10	9	7	24	19	13
2569	♂ ad.	Mar. 12	79	83	90	9.5	8.5	7	25	19	13
2570	♂ ad.	Mar. 12	79	86	94	9.5	9	7	24	19.5	13
2571	♂ ad.	Mar. 12	80	87	94.5	9.5	9	7	24.5	19.5	13
2580	♂ ad.	Mar. 22	80	87	96	10	9	7	24.5	20	13.5
2587	♂ ad.	Mar. 26	81.5	87	95	10	8.5	6.5	24	19	13
		Av'g...	79.5	85.6	93.7	9.5	8.9	7	24.9	18.9	13
2388	♀ ad.	Jan. 5	74	—	—	9.5	9	6.5	24	18	13
2586	♀ ad.	Mar. 26	75.5	81	90	10	9	7	25.5	19	13
		Av g...	....	.....	.....	.....	.....	.....	...	....	....

No. 2419.—Testes large. Iris orange, tinged with carmine around pupil.

No. 2459.—Iris orange, tinged with carmine.

No. 2507.—Iris carmine.

No. 2569.—Iris carmine.

No. 2388.—Iris orange.

22. *Ampelis cedrorum*.

CEDAR WAXWING.—Christmas morning was the brightest and fairest I enjoyed during more than one hundred days of my sojourn on the island. Taking a stroll through the small cypress grove in search of birds not before met with, I was rewarded by seeing what I supposed to be one of this species, but was unable to capture it. Nothing was seen or heard of it again for more than a month, until one pleasant afternoon, as I was engaged in preparing specimens in the tent, I heard the notes of the Cedar Bird close by, and

going outside, was just in time to get a flying shot at the retreating bird—but missed it. Those who have had a similar experience can imagine my feelings when that bird disappeared. I knew, beyond any reasonable doubt, that it was *A. cedrorum*, yet the lack of any positive evidence of the fact, left me brooding over my disappointment for the next two hours. The unexpected reappearance of the bird, however, quickly dispelled the gloom. This time I took all possible precaution, and succeeded in making this handsome addition to my collection of Guadalupe stragglers.

DATA OF SPECIMEN COLLECTED.

Collector's Number.	Sex and age.	Date.
2437	♂ im.	Jan. 28, 1886.

Remarks—No wax tips.

23. *Lanius ludovicianus excubitorides*.

WHITE-RUMPED SHRIKE.—Two specimens of these butcher-birds were seen on the central part of the island. Both were heard singing in low, liquid tones, quite pleasing to the ear. They were very shy, although to a less degree than birds of the same species which were met with in 1885 on Cerros Island, Lower California.

Considering the abundance of larvæ, coleopterous insects and occasional grasshoppers, one would suppose that the "mênu" of the Shrike left nothing for her to desire, but on dissecting a specimen, I found amongst the caterpillars, which the distended gizzard contained, a tiny golden foot of Guadalupe's sweetest songster, the Dusky Kinglet.

In color this bird is much lighter than the same species from Oakland, Cal., and more closely resembles specimens from Tulare, Cal., and Tucson, A. T.

DATA OF SPECIMEN COLLECTED.

Collector's Number.	Sex and age.	When Collected.
2370	♀ <i>ad.</i>	December 29, 1885.

24. *Dendroica auduboni*.

AUDUBON'S WARBLER.—The only ones seen, two in number, were taken on stormy days in the small cypress grove.

LIST OF SPECIMENS COLLECTED.

Collector's Number.	Sex.	Date.
2368	♂	December 28, 1885.
2404	♂	January 12, 1886.

25. *Anthus pensilvanicus*.

AMERICAN PIPIT.—On the evening of February 2, while going to the alkali pools to watch for owls, I heard faintly the note of a Titlark. The evening was very calm, the sun, just set, cast a beautiful afterglow about the sky; there was just light enough remaining to enable me to distinguish the birds working their way among the rocks. That I might make sure of at least a single specimen for identification, I fired at the one nearest me. The flock, about twenty-five in number, at once rose and circled past out of range; and I saw them no more.

DATA OF SPECIMEN COLLECTED.

Collector's No.	Sex.	Date.
2451	♂ (?)	February 2, 1886.

26. *Oroscoptes montanus*.

SAGE THRASHER.—In making my rounds of the small cypress grove on a cold, cloudy and windy morning in Jan-

uary, I saw and heard fewer birds than ever before or since. It was seldom that I did not take or note something of interest on these short excursions, and on this day I secured a handsome specimen of the Sage Thrasher, which was found among the leafless branches of a fallen tree. No song nor even a single note was heard from him.

DATA OF SPECIMEN COLLECTED.

Collector's No.	Sex and age.	Date.
2400	♂ <i>ad.</i>	January 7, 1886.

Remarks—Iris yellow. Fat. Contained only caterpillars.

27. *Mimus polyglottos*.

MOCKING BIRD.—Two birds, apparently a mated pair, were seen on a fallen pine at the northern edge of the palm grove. First attracted to the place by the delightful song which floated upon the air, I saw one of the birds in the act of pouncing upon something in the grass, in the manner of a shrike. When alarmed they flew higher and higher among the branches of a tall pine, so that only the female was captured. Having never before seen this bird in a wild state, I regretted the act which, in compliance with strict scientific requirements, deprived that sea bound spot of so much sweet music.

SPECIMEN COLLECTED.

Collector's No	Sex and age.	Date.
2579	♀ <i>ad.</i>	March 16, 1886.

Remarks—Iris yellow. Ovaries small.

28. *Salpinctes guadeloupensis*.

GUADALUPE ROCK WREN.—This species, undoubtedly the most common of the birds on the island, was distributed

from the beach to the summit, but was found to be most numerous on the upper and central portions. They were by nature tamer than any birds I ever met with. While retreating, if approached, they would in turn draw quite near to a person who remained perfectly quiet. Sitting down one afternoon upon a log, I saw a Rock Wren come hopping closer and closer to where I was resting, until at length he perched upon my shoe. Then seeing a sandy spot just beyond, he availed himself of the opportunity by taking a dust-bath. So close was he to me that I could have reached him with my foot, yet constantly in motion, searching here and there among the rocks for food, he seemed entirely unconscious of my presence. Even when standing they are seldom quiet, a nervous twitch of the tail or toss of the head bearing witness to the incessant activity so characteristic of these little creatures.

Seldom silent, they have, in addition to their ringing call, a considerable variety of song. I became accustomed to the variations of four or five different birds, and noticed that each had a song peculiar to himself but differing from the songs of his fellows. One little wren near camp was in the habit of beginning his song each morning at about half-past six, never varying five minutes from his self-appointed time. They are usually seen on the ground or upon a rock or stump. One remarkably foggy morning, I noticed one sitting on the top of a sage-bush, while on fine days, I have seen them mounted to the height of twenty feet on a dry cypress twig, singing their cheerful song.

Their food consisted mainly of caterpillars and beetles. I watched one pick to pieces and devour successively three small Carabide beetles.

The weather does not seem to be taken into consideration by any of the resident species. The rock-wrens are the first to begin nesting, and endeavor to conduct their domestic affairs through the stormiest times, though not always with success. Many abandoned nests were found,

some with and some without eggs, deserted, probably, on account of long continued wet weather. The location of the nest, however, plays an all-important part in the success or failure of the first builders. A few birds began the construction of their nests in December, and one had her work nearly completed on the 25th of December, 1885. Four fresh eggs were found in it on January 17th. The breeding season, strictly speaking, extends from the middle of January through the month of March.

Nests were found in cavities of immense boulders, under rocks, in fallen and decayed trunks of cypress trees, the latter location being apparently a favorite one. But wherever the nests were located the passages leading to them were, with one or two exceptions, paved with flat pebbles ranging in size from a Lima bean to a half dollar. Fully a quart of these pebbles were removed from the entrance to a nest built in a boulder at a height of four feet, where, at some previous time, other birds had evidently built and accumulated their share of the pavement. As a rule scarcely an ordinary handful of stones are used. The nest is built in close conformity to the size and shape of the cavity which it occupies, being usually circular and varying from a shallow bed of fine dry grasses to a nest of the same material measuring 150 mm. in diameter and 60 mm. high. The egg receptacle is from 55 mm. to 70 mm. in diameter, and not more than 30 mm. in depth. A lining of goat hair when obtainable is invariably used. I followed one bird fully an hundred yards from the spot where she had collected some goat hair before the nest was reached.

The eggs are usually four, though sometimes five in number, and resemble both in color and shape those of the common rock-wren (*S. obsoletus*).

Set No. 781 (author's oölogical collection) measures: 17 x 14; 17 x 14.5; 18 x 14.5; 18.5 x 14.5 mm.

Set No. 782 (author's oölogical collection) offers the fol-

lowing measurements in millimeters: 19 x 14; 19 x 14; 19.5 x 14.5; 19.5 x 14.5; 19.5 x 15.

The average size ascertained from a series of fifty-five eggs, is 19 x 14 mm.

The two largest eggs measured 21 x 15 mm. and 20 x 16 mm. respectively; the two smallest, 17 x 14 mm.

Two different stages of the young plumage were taken, descriptions of which are here given:

Ch.—Young. Above similar to adult but *much* darker, especially the head and neck, which lack the speckled markings. Wings and tail as in adult but darker, the bars across middle tail-feathers dull black. The outer half of the pale cinnamon on end of tail-feather finely mottled with dusky. Under parts pale pinkish cinnamon; the entire throat obscured with a faint dusky suffusion. Crissum darker than abdomen and unmarked.

Wing, 67 mm.; tail feathers, 53 mm.; bill from nostril, 12 mm.; tarsus, 19 mm.; middle toe, 13 mm.

(No. 2530—Immature, author's collection. Guadalupe Island, February 19, 1886.)

First Plumage.—Above lighter than the immature specimen and grayer than the adult plumage. Below, including throat, pale sulphurous white, becoming pinkish on sides, and crissum, which is unmarked.

Wing, 57 mm.; tail feather, 34 mm.; bill from nostril, 8.5 mm.; tarsus, 20.5 mm.; middle toe, 14 mm.

(No. 2425—Nestling, author's collection. Guadalupe Island, January 23, 1886.)

By the table of measurements it will be seen that the bills of specimens (collected eleven years after the species was discovered) average about 15.5 mm.; while those taken in 1875 I find to average fully a millimeter less. A decade hence it will be interesting to know whether this increasing development has still continued.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date, 1886.	Wing.	Tail feathers.	Tail.	Bill from nostril.	Tarsus.	Middle toe.
			mm.	mm.	mm.	mm.	mm.	mm.
2395	♂ <i>ad.</i>	January 6.	65	48	52	15	21	14
2397	♂ <i>ad.</i>	January 6.	66.5	49	54	15.5	21	13
2398	♂ <i>ad.</i>	January 6.	67	48.5	56	17	21	14
2422	♂ <i>ad.</i>	January 23	69	52	—	16	20	13
2423	♂ <i>ad.</i>	January 23.	68	49	54	16	22.5	14
2443	♂ <i>ad.</i>	January 29.	68	51	57	15	22	14
2444	♂ <i>ad.</i>	January 29.	68	52	57	16	22	14
2445	♂ <i>ad.</i>	January 29.	66	48	54	16	21	14.5
2534	♂ <i>ad.</i>	March 4.	71.5	53	58.5	17	22	14.5
2630	♂ <i>ad.</i>	January 29	68	52	57	15	21	15
Average..			67.7	50.2	55.5	15.8	21.3	14
2396	♀ <i>ad.</i>	January 6.	66	50	55	16.5	21	14
2446	♀ <i>ad.</i>	January 29.	64	45	50	17	21.5	15
2449	♀ <i>ad.</i>	January 29.	63	46	54	15	21	13
2450	♀ <i>ad.</i>	January 29.	64	47	53.5	14	20	13
Average..			64.2	47	53.1	15.6	20.8	13.7

No. 2534.—Ferruginous shade on breast and abdomen.

No. 2396.—Feathers worn off breast from setting. Length, 152 mm.; extent, 217 mm.

No. 2446.—Contained four very large ova.

29. *Thryothorus brevicaudus*.

GUADALUPE WREN. — This rare local species has become much restricted in distribution and perhaps in number since Dr. Palmer obtained the only two known specimens in 1875. I am informed that no collecting was done at that time among the pines on the northern portion of the island, in which place alone was I able to discover any trace of this species; and as no collecting was done by Dr. Palmer among the palms (an unlikely place for the birds to be found), I infer that the two original specimens must have been found toward the central portion of the island.

The birds were timid rather than shy, being alarmed by the crushing of dry branches as I worked my way amid the dense windfalls of pines, where they were found, they

fled into the thickest parts. When all was quiet they would cautiously approach until within a few feet of me, seemingly prompted by curiosity. Fearing the complete extermination of a species so restricted in distribution, I refrained from taking more specimens. All that I secured were taken within an area of sixty by three hundred feet, nor were any seen elsewhere. A frightened female uttered a few "twit" "twits" of alarm, but with this exception they were utterly silent.

A careful and protracted search during the greater part of two days, with the aid of my Mexican companion, failed to discover the whereabouts of a nest, the eggs of which remain unknown.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date, 1886.	Wing.	Tail feathers.	Tail.	Exposed culmen.	Bill from nostril.	Tarsus.	Middle toe.
2483	♂ ad.	Feb. 16	mm. 48	mm. 44	mm. 48	mm. 17.5	mm. 12	mm. 17	mm. 12
2484	(?) ♂ ad.	" "	49	44	50	17	12	18	12
2486	♂ ad.	" "	48	43	47.5	17	12	17	12.5
2487	♂ ad.	" "	48	45	47	17	12	18	12
Av'g..			48.2	44	48.1	17.1	12	17.5	12.1
2482	♀ ad.	Feb 16.	47	43	45	16	11	18	11
2485	♀ ad.	" "	47	42	47	16	11	17.5	11.5
2488	♀ ad.	" "	49	43	47	17	11.5	17.5	12
Av'g..			47.6	42.6	46.3	16.3	11.1	17.6	11.5

No. 2483.—Contained insects and two pine seeds. Length, 134mm. Extent, 165 mm.

No. 2484.—Sex not determined.

No. 2482.—Ovaries large. Eyes, dark brown. Contained insects.

No. 2485.—Ovaries small.

No. 2488.—Ovaries large.

30. *Sitta canadensis*.

RED-BREASTED NUTHATCH.—Tolerably common among the

pine timber, and found nowhere else except in the large cypress grove, where two or three were heard.

By the 10th of March several birds had begun their preparations for nesting. Selecting a dead pine stump or branch they worked industriously, striking little resounding taps with their bills. Two unfinished holes were found, one at a height of about forty feet in a slender dead pine, being just commenced, while the other, near the top of a pine stump fifteen feet high, had been cut to a depth of four or five inches, thus rendering necessary the removal of chips. This process was effected by regular stages, the bird bringing a mouthful of debris to the opening, where, entirely visible with the exception of her tail, she clung to the edge of the opening, head downward, until the chips were launched into the air.

Specimens which were taken on January 26 and February 16, do not vary in size from specimens of this species from other localities.

31. *Regulus obscurus*.

DUSKY KINGLET.—Frequenting more numerous the large cypress grove, they are nevertheless found in the smaller grove, and also among the pines. In the former and latter places they are positively known to breed, and there is but little doubt that they also nest in the small grove. They are much tamer than others of this genus found elsewhere, still they do not seek a close acquaintance with a person of hunting proclivities.

In December I found them in full song and as common as in April, although strange as it may seem, it was not until the latter month that any were noticed by Dr. Palmer.

Their song is indescribably sweet and musical, and of wonderful power for so small a bird, commencing with a few low, quick notes, as though the singer were merely trying his voice, then bursting into a full animated warble, it ends in a dissyllabic measure, accented on the first syllable, and usually repeated from three to six times. One remark-

ably fine songster repeated the final dissyllable eight or ten times. Only once did I hear the metallic click, so common with the Oakland birds in winter, but even then it flowed immediately into song.

As early as the middle of February nest-building was in order, the birds selecting the topmost foliage of a cypress, and sometimes the very outer extremity of a horizontal branch.

As the result of many days' diligent search, three nests came under my observation, and these were detected only by watching the birds as they collected building material, or by tracing to its source a peculiar, low song, which the male sometimes sings when close to the nest.

These nests were all found over twenty feet high, and only one could be seen from the ground, and that merely during the intervals when the wind parted the branches. They were placed in the midst of a thick bunch of foliage, and but lightly secured to the twigs. Compact, though not very smooth in structure, they were composed of soft strips of bark intermingled with feathers, bits of moss, fine grass and cocoons. Additional warmth is secured by a quantity either of goat's hair or feathers, and, lastly, a thin lining of goat's hair. Their external measurement is about 70 mm. in height by 90 mm. in diameter, while the internal depth is about 45 mm., and diameter from 35 mm. to 45 mm.. The mouth of the opening is smaller than immediately below.

A nest containing two fresh eggs (set No. 799, author's oölogical collection) was found in the top of a slender cypress twenty-five feet high, March 24. It could not be seen from the ground, but was located by the subdued song of the male bird. As I ascended the tree and approached the nest, the female flew off and joined her mate in a neighboring tree. She made no demonstrations whatever, and was not again seen, while her partner, undisturbed by my intrusion continued to warble his richest song.

In color the eggs are white, with a dense wreath of pale yellowish-brown spots encircling the larger end. In some places, these spots appear to be laid over a pale lavender washing, and in one specimen, these fine, almost indistinct dots extend sparingly over the entire surface. They measure in millimeters 14 x 11 and 15 x 11.

LIST OF SPECIMENS COLLECTED.

Collector's No.	Sex and age.	Date, 1886.	Wing	Tail feathers.	Tail.	Bill from nostril.	Tarsus.	Middle toe.	Length.	Extent
			mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
2371	♂ ad.	Jan. 2	56	44	47	7	19.5	10.5	114	169
2390	♂ ad.	Jan. 6	53	40	—	6.5	18	10	.....	.....
2391	♂ ad.	Jan. 6	53	40	—	6	20	10	111	164
2392	♂ ad.	Jan. 6	55	43	—	6.5	19	10	.....	.....
2399	♂ ad.	Jan. 6	54.5	41.5	—	6	20.5	10	.....	.....
2412	♂ ad.	Jan. 23	54.5	43	—	6	19.5	10.5	.....	.....
2413	♂ ad.	Jan. 23	55	44	—	7	20	10.5	.....	.....
2414	♂ ad.	Jan. 23	56.5	46	49	7.5	19.5	10.5	.....	.....
2441	♂ ad.	Jan. 29	56	44	—	7.5	20	10	.....	.....
2455	♂ ad.	Feb. 2	55	43	—	6.5	19.5	11	.....	.....
		Av'g.	54.8	42.8	—	6.6	19.5	10.3	.....	.....
2373	♀ ad.	Jan. 2	51	38.5	42.5	6	19	10	.....	.....
2439	♀ ad.	Jan. 29	51	40	41	6.5	19	10	.....	.....
2456	♀ ad.	Feb. 2	52	40.5	44.5	6	19.5	10	.....	.....
		Av'g.	51.3	39.6	—	6.1	19.1	10	.....	.....

No. 2371.--Iris dark brown.

No. 2456 --Ovaries small.

The length of bill from nostril of the males taken by Dr. Palmer, all measure 6.3 mm., and the single female has the bill but 5.5 mm., showing a slight increase in length during the past decade. As this measurement can be so accurately taken, I believe the difference is an actual one.

32. *Turdus aonalaschkæ*.

DWARF HERMIT THRUSH.—The strange shyness of the straggling avifauna of Guadalupe Island was well exempli-

fied in the first specimen of this species which I met with. On the 24th of December, I thought I heard the note of a Dwarf Thrush, a sound quite familiar to me during the winter season at Oakland, but could not get a sight at the author of it. The bird was heard for several consecutive mornings in the cypress grove adjoining my camp, but was not seen until the 2d of January. He then succeeded in eluding me and leading me a daily chase until the 7th of January, when he was accommodating enough to call at camp in the evening, announcing his arrival by calling out quickly "chut," "chut." As the sound apparently proceeded from beneath a fallen cypress I worked my way cautiously in that direction, keeping tree trunks between myself and the place. The ground being smoother than where I had previously found him, I was not obliged to look to every footstep, and finally arriving within range, I caught sight of him on the ground. The report of the gun was tremendous in the still evening air, and the result final. I soon had the long-sought prize in hand, beautiful, as freshly killed specimens of *Turdus* always are. Two other specimens were afterwards taken, one in the large palm grove, the other among the cypress. Neither, however, was so difficult to approach as the first.

LIST OF SPECIMENS COLLECTED.

Collector's Number.	Sex and age.	Date, 1886.	Remarks.
2401	♂ <i>ad.</i>	January 7.	Iris dark brown
2436	— <i>ad.</i>	January 23.	
2583	♂ <i>ad.</i>	March 26.	

33. *Merula migratoria propinqua*.

WESTERN ROBIN.—First seen in December. In January three birds were found and taken on the border of the small cypress grove.

LIST OF SPECIMENS.

Collector's Number.	Sex.	Date, 1886.	Remarks.
2382	♀	January 4.	Fat. Head only saved.
2386	♀	January 4.	
.....	--	January 8.	

34. *Hesperocichla nævia*.

VARIED THRUSH.—One bird only was seen on the island among the pine timber.

DATA OF SPECIMEN.

Collector's Number.	Sex and age.	Date.
2533	♀ <i>ad.</i>	March 4, 1886.

Remarks—Gizzard contained larvæ, beetles and one pine seed.

35. *Sialia arctica*.

MOUNTAIN BLUEBIRD.—Three birds of this species were seen on several occasions on the edge of the small cypress grove; a single one being noticed for the last time on the 15th of February.

DATA OF SPECIMEN COLLECTED.

Collector's Number.	Sex and age.	Date.
2369	♂ <i>ad.</i>	December 29, 1885.

Remarks—Iris dark brown. Gizzard contained caterpillars and an elytron of a beetle.

STANDARD GEODETIC DATA.

COMMUNICATED BY AUTHORITY OF THE SUPERINTENDENT OF THE UNITED STATES
COAST AND GEODETIC SURVEY.

BY PROF. GEORGE DAVIDSON.

Read October 18, 1886.

In the development of the main triangulation of the Pacific Coast, it was early discovered that large and irregular deflections of the plumb-line existed at the triangulation stations, whether they were situated on the mountains or in the plains.

When the main triangulation was undertaken it embraced lines of unusual length, and one part of the scheme was the projection of a network across the continent along the 39th parallel.

In order to collect standard geodetic data for the computation of the geographical positions on this coast, Assistant Davidson planned at the outset to have the latitude observed at each triangulation point; and he also observed the azimuth of some one line in the series of directions which were observed from the same station.

This scheme of triangulation commenced from an accurately-measured base-line of nearly eleven miles in length situate in the plains of Yolo county, California. From this line it was carried by quadrilaterals to the Coast Range of mountains, as far west as Mount Tamalpais; and from the line Mount Helena—Mount Diablo it stretched across the great valley of California to the line Mount Lola—Round Top. This scheme of triangulation was named by the Superintendent of the United States Coast and Geodetic Survey the "Davidson Quadrilaterals." The observations at all the stations have been shown to be remarkably satisfactory, and the discussion has been rigorously carried out in

the computing division of the Survey, under the direction of Assistant Schott. From the means already at hand, the following summary of results is made known, wherein it is seen that the accepted standard station for latitude is Mount Helena, and the standard line for azimuth is Mount Helena—Mount Diablo. The tabulation exhibits the observed and computed latitudes and azimuths, the probable error of each determination, and the deflection of the plumb-line from the means.

Including the stations Mount Lola and Round Top, which are the easternmost points of the "Davidson Quadrilaterals," in the Sierra Nevada, we have nine stations, at each of which the latitude and azimuth were determined astronomically; and we shall take the mean results derived from all these observations for the formation of the standard values φ_0 and α_0 .

The direct results of the astronomical observations for latitude require two corrections: one, the reduction to the station point \triangle ; the other, the correction for curvature of the vertical or reduction to the sea level. The heights required for the latter purpose are given in Appendix No. 10, Coast and Geodetic Survey Report for 1884, (Mount Lola being 2,796.4 metres, or 9,175 feet; and Round Top 3,173.5 metres, or 10,412 feet above the level of the sea.)

For the expression of the curvature between the sea-level and the altitude of the station, we have (see Clarke's Geodesy, pp. 101-102), $\delta\varphi = -\frac{h}{r \sin 1''} (\frac{5}{2} m - e') \sin 2\varphi$. Putting $\frac{5}{2} m - e' = 0.0052$ ¹, and $\log. (r \sin 1'') = 1.490$, then for h , the height in metres, and $\delta\varphi$ the correction in seconds of arc we have for the latitude φ

$$\delta\varphi = -0.000167h \sin 2\varphi; \text{ or } [n \ 6.212]h,$$

for the average latitude 39° ; the number within brackets being a logarithm.

¹.—G. Zachariae, in his *Principal Geodetic Points* (German translation by Dr. Lampe, Berlin, 1878), prefers the value 0.00513.

The mean difference is sufficiently near zero to retain the old value, and we adopt for the present a_o Mount Helena to Mount Diablo:

$$324^{\circ} 01' 31.''04 \pm 00.''64.$$

This value will slightly change after the Mount Lola and Round Top observations shall have been finally adjusted. The average local difference in azimuth is about $2.''1$.

At the stations Mount Diablo and Mount Helena the astronomical azimuths were referred to a mark and not to a triangulation point, and the same is the case at Mount Lola and at Round Top.

The references to the stations marked by an asterisk [*] in the preceding table would therefore be arbitrary since the results must depend on the adjustment of the directions of the figure; but by applying a correction which is the mean of all the corrections to the lines at the stations, the reference of the astronomical meridian to the geometrical figure of the triangulation is effected with respect to all directions; thus for the two stations in question:

At Mount Diablo:—

Observed azimuth of the reference mark (Clayton)=
 $9^{\circ} 42' 25.''92$ West of North; hence, astronomical azimuth
of the mark = $170^{\circ} 17' 34.''08$
Or when reduced to the sea level = $170 \ 17 \ 34. \ 07$

At Mount Diablo the mean correction to the
six adjusted directions is $+ 0.''023$
($\pm 0.''11$); this added to the observed
geodetic direction of the azimuth
($25^{\circ} 49' 17.''194$) gives = $25 \ 49 \ 17. \ 217$

Hence with the corrected direction to Mount
Helena (see below) = $359 \ 59 \ 59. \ 273$

The angle between the mark and Mount He-
lena, adjusted = $25 \ 49 \ 17. \ 94$

and the astronomical azimuth referred to
Mount Helena becomes $144 \ 28 \ 16. \ 13$

as given in the preceding table.

Similarly at Mount Helena:—

The Observed Azimuth of the reference mark (Woods)=	189 18 14. 36
the same reduced to the sea level	189 18 14. 37
The mean correction to four adjusted directions at the station is $-0.''032 (\pm 0.''13)$.	
The angle between the mark and Mount Diablo adjusted=	225 16 49. 51
Whence the Astronomical Azimuth, referred to Mount Diablo=	324 01 24. 86

We have also the following table of adjusted directions at these two stations:—

AT MOUNT DIABLO.				AT MOUNT HELENA.			
Direction to	Result of Station Adjustment	Cor'n. Figure Adjust.	Final Seconds.	Direction to	Result of Station Adjustment	Cor'n. Figure Adjust.	Final Seconds.
Mt. Helena.....	359 59 59.918	— .645	59.273	Mt. Diablo.....	359 59 59.927	+ .183	60.110
Monticello.....	20 03 30.611	— .102	30.509	Mt. Tamalpais.....	33 43 57.138	+ .303	57.441
Vaca Mt.....	20 19 59.481	+ .319	59.800	Azim. Mark (Woods)	225 16 49.650		(49.618)
Azim. Mark (Clayton)	25 49 17.194		(17.217)	Monticello.....	306 46 16.069	+ .008	16.077
North West Base.....	38 39 09.129	+ .086	09.215	Vaca Mt.....	340 03 44.097	— .621	43.476
South East Base.....	43 24 20.921	+ .524	21.445				
Mt. Tamalpais.....	310 12 09.218	— .047	09.171				
	Mean = +	0.023			Mean = —	0.032	

Tables of resulting adjusted directions were prepared for all stations, because the respective mean corrections are to be applied to all other directions not yet adjusted before they can be submitted to the process of the next figure adjustment which ordinarily is of a secondary character.

For the standard *Longitude* of the triangulation about the Yolo Base Line, we have to retain at present the telegraphic longitude of San Francisco station at Washington Square, $\lambda = 8h\ 09m\ 38.34\ secs$, (see Coast and Geodetic Survey Report for 1884, Appendix No. 11, p. 424) and derive from it for

Mount Helena the value $\lambda_{\odot}=122^{\circ} 38' 01.'' 41$. [This gives for the present astronomical and telegraphic longitude station, Lafayette Park in San Francisco, the longitude west of Greenwich= $8h\ 09m\ 42.72s$, or $122^{\circ} 25' 40.'' 75$.]

These standard geodetic data φ_{\odot} a_{\odot} λ_{\odot} are subject to changes hereafter; but generally they are best retained and the small corrections are noted, so long as the changes do not exceed the respective probable errors of these quantities.

EARLY SPANISH VOYAGES OF DISCOVERY ON THE COAST OF CALIFORNIA.

PROF. GEORGE DAVIDSON, A. M., PH. D.

Read at the meeting of the Academy, Monday, October 18, 1886.

The following tabulation exhibits in a condensed form the identification of the "landfalls" of Cabrillo and Ferrelo, in their explorations of the coast of California in 1542 and 1543, from Cape San Lucas to latitude $42^{\circ} 30'$.

During my work on the Pacific Coast of the United States since the spring of 1850, I have been deeply interested in the discoveries and explorations of the early Spanish navigators. My special duties have made me peculiarly well acquainted with the coast line, and I have thought it my duty to establish the identity of the landfalls, which I believe I have clearly done. Unfortunately, the great length of the paper in which I have given the details of the narratives of Ulloa, Cabrillo, Ferrelo, Drake and Vizcaino, and my explanations, together with a chart, precludes its publication by the Academy at this time; and it has been presented, *in extenso*, to the Superintendent of the U. S. Coast and Geodetic Survey for publication.

This tabulation contains the resumé of the identification of the sixty-eight places which Cabrillo and Ferrelo particularly mention. In it are shown, in parallel columns, the names by which Ulloa, Drake and Vizcaino designated the same localities, together with the modern names. The latitudes of Cabrillo and Ferrelo were given only to a third of a degree, with an occasional qualification of "a little more," or "a little less," while the large and nearly constant errors indicate very defective instruments. The present latitudes are taken from the published charts of the United States Coast and Geodetic Survey.

It should be understood that the whole of the work embraced in the paper and in this condensed statement has occupied much of my unofficial time during the last two years.

THE LANDFALLS OF CABRILLO, (C), AND FERRELO, (F), WITH
AND THE PRESENT

No.	Dates, 1542, 1543.	Name of place by Cabrillo and Ferrelo.	Latitude by Cabrillo and Ferrelo.	Names by Ulloa, Drake or Vizcaino.
1	Jun. 22, 1542 Apr. 14, 1543	El Puerto de Navidad	.....C. F..	El Puerto de la Navi- dad. V.
2	Jun. 28, 1542	El Cabo de Corrientes	20½°, C..	El Cabo de Corrientes. V.
3	July 2, 1542	La Punta de California	24° "and more," C..	
4	.....	El Puerto del Marques del Valle.....	Do.....	La Bahía de Santa Cruz. U.
5	July 6, 1542	El Puerto de la Cruz.. El Puerto de San Lu- cas	Do..... .....C F..	La Bahía de San Ben- arbè. V.
6	July 8, 1542	El Puerto de La Trin- idad.....	25°, ....F..	La Bahía de San Abad. U.; La Bahía de Santa Marina. V.
7	" " "	La Punta de la Trini- dad	25°. C. F..	
8	" " "	Una Isla.....	.....F..	
9	" 13, 1542	El Puerto de San Ped- ro	25½°, F..	El Puerto de la Mag- dalena. V.
10	.....	La Bahía de San Mar- tin. ....	.....F..	La Bahía de Santa Marta. V.
11	" "	Una Gran Ensenada	26°, F..	
12	July 19, "	El Puerto de la Mag- dalena	27° C. F..	
13	" -- "	La Punta de Santa Catalina.....	.....
14	" 25 "	El Puerto de Santiago	27½°, F..	La Bahía de las Bal- lenas. V
15	" — "	Habre Ojo.....	27½°, F..	Abreojos, V.'s chart
16	" — "	Punta y Puerto de Santa Ana.....	28°, F..	
17	" — "	Una Isleta obra de una legua de Tierra	28°, F..	La Isla de San Roque. U. V.

THEIR NAMES BY ULLOA, (U), DRAKE, (D), AND VIZCAINO, (V),
NAMES AND LATITUDES.

No.	Present Name of the Place.	Latitude, ° /	Correction to C., F. or D.	Remarks.
1	Port Navidad.....	19 13	.....
2	Cape Corrientes.....	20 25	-05' (a)....	(a) It is more than probable that Cabrillo assumed the latitude as given by previous navigators.
3	Cape Pulmo.....	23 23	-37', "and more" C..	
4	Anchorage under Cape Pulmo... ..	23 23	-37', "and more" C..	
5	San Lucas Bay.....	22 52	.....	Cabrillo did not observe the latitude. "They say it is in latitude 23," F.
6	Santa Marina Bay....	24 20	-40' F..	
7	Cape Tosco.....	24 17	-43' C. F..	The S. E. point of Santa Margarita Island.
8	Santa Margarita Island	24 17	.....	The island is 22 miles long.
9	Magdalena Bay.....	24 32	-58' F..	
10	Santa Maria Bay.....	24 44	.....
11	.....	.....	.....	There is no gulf; but the lowland north of Cape Lazaro slightly recedes, and would mislead a navigator in a small vessel in the offing.
12	Pequeña Bay and Point.....	26 14	-46' C. F..	Ferrelo says: "It is 40 leagues from the Bay of San Martin to this coast."
13	San Domingo Point and Anchorage.....	26 19	.....
14	Ballenas Bay.....	26 45	-45' F..	
15	Abreojos Rocks.....	26 46	-44' F..	A dangerous reef of visible and sunken rocks.
16	Asuncion Point and Anchorage	27 07	-53' F..	
17	Island of San Roque..	27 09	-51' F..	Ulloa saw the two islands, Asuncion and San Roque.

THE LANDFALLS OF CABRILLO, (C), AND FERRELO, (F), WITH
AND THE PRESENT NAMES

No.	Dates, 1542, 1543.	Name of place by Cabrillo and Ferrelo	Latitude by Cabrillo and Ferrelo.	Names by Ulloa, Drake or Vizcaino.
18	July 27, 1542	El Puerto Fondo.....	..... F.	
19	July 31, 1542	[Anchorage] .....	..... F..	
20	Aug. 1 " "	El Puerto de San Pedro Vincula	28½° "and more," F..	El Puerto de San Bartolomè. V.
21	" 2 " "	La Isla de San Esteban .....	..... F..	La Isla de Natividad de Nuestra Señora. V.
22	Aug. 2, 1542	Una Ensenada Grande .....	..... F..	
23	" 5 " " Mar. 28, 1543	La Isla de Zedros	29°, F..	La Isla de los Cedros. U ; La Isla de Cedros. V.
24	Aug 11, 1542	El Puerto de Santa Clara.....	30° "scant" F	La Bahía de San Hipolito. V
25	" 14, 1542	La Punta del Mal Ab-rigo	30½°, F..	
26	" 19 " "	La Isla de San Bernardo	30½°, F..	La Isla de San Geronymo. V.
27	" 20 " "	El Cabo del Engaño... La Punta del Engaño.	31°, C.. 31°, F..	El Cabo del Engaño, 30°, U. Do.
28	" 20 " " Mar. 21, 1543	El Puerto de la Posesion.....	31½°, F..	La Bahía de las Virgines. V.
29	Aug. —, 1542	La Isla de San Augustin.....	..... F..	La Isla de Cenigas. V. La Isla de San Hilario. V.
30	Sept. 4, 1542	[Anchorage, 7 leagues from San Augustin.] .....	..... F..	
31	" 8 " "	El Cabo de San Martin	32½°, F..	
32	" 11 " "	El Cabo de la Cruz....	33°, C..	
	" 11 " "	El Cabo de Cruz.....	33°, F..	
33	" 11 " "	Una Isleta.....	..... F..	
34	" 17 " " Mar. 18, 1543	El Puerto de San Mateo.....	33½°, F..	La Ensenada de Todos Santos. V.

THEIR NAMES BY ULLOA, (U), DRAKE, (D), AND VIZCAINO, (V),
AND LATITUDES.—CONTINUED.

No.	Present Name of the Place.	Latitude, ° ' ''	Correction to C., F. or D.	Remarks.
18	Table-Head Cove, or San Pablo Bay	27 11	.....
19	Bay of San Cristoval .....	.....	.....
20	Port San Bartolomè..	27 39	—51' "and more" F	
21	Natividad Island....	27 53	.....	The Afégua, or Bird Island of Father Taraval, 1734.
22	Sebastian Vizcaino Bay	27 45 to 28 35	.....	This is the Gulf of San Xavier, of Father Tara- val. It is 50 by 60 miles in extent.
23	Cerros Island	28 02	—58' F..	They anchored under the south shore. This is the Amalgua, or Fog island of Father Taraval, 1734.
24	La Playa Maria Bay .	28 55	—65' "scant" F	They anchored here.
25	Point Canoas.....	29 25	—65' F ..	
26	San Gerónimo Island.	29 48	—42' F ..	
27	Point Baja.....	29 56	—64' C ..	
	Point Baja.....	29 56	—64' F :	
28	Port San Quentin....	30 24	—66' F..	
29	San Martin Island ...	30 29	.....
30	San Ramon Bay	30 49	....
31	Point Santo Tomas, or Cape San Tomas.	31 33	—57' F..	The anchorage under the cape.
32	Grajero Point, or Ban- da Point.....	31 45	—75' C..	Distance from Cape San Martin, 4 leagues.
	Do.....	31 45	—75' F..	
33	The Todos Santos Is- lands.....	31 48	.....
34	The Ensenada in To- dos Santos Bay	31 51	—89' F..	Anchorage in the north- east part of Todos Santos Bay.

THE LANDFALLS OF CABRILLO, (C), AND FERRELO, (F), WITH
AND THE PRESENT NAMES

No.	Dates, 1542, 1543.	Name of place by Cabrillo and Ferrelo.	Latitude by Cabrillo and Ferrelo.	Names by Ulloa, Drake or Vizcaino.
35	Sep. 26, 27, 1542.... ..	Las Islas Desiertas...	34°, F..	Las Islas de los Coronados. V; Las Islas de San Martin, V.'s chart.
36	Sep. 23, 1542 Mar. 11, 1543	El Puerto de San Miguel.....	34½°, F..	El Puerto de San Diego V.; El Puerto Bueno de San Diego, V.'s chart.
37	Oct. 7, 1542	La Isla de San Salvador.....	.....F..	La Isla de Santa Cathalina. V.
38	Oct. 7, 1542	La Isla de la Vittoria.....	.....F..	
39	Oct. 8, 1542	La Bahia de las Fu- mos.....	35°, F..	
		La Bahia de los Fue- gos.....	.....F..	
40	Oct. 9, 1542	[Anchorage].....	.....F..	
41	Oct. 10, 1542	Los Pueblos de las Canoas	35½°, C..	
	Mar. 8, 1543	El Pueblo de las Can- oas	35½°, F..	
42	Oct. 13, 1542	[Anchorage].....	.....F..	
43	Oct. 14, 1542	[Anchorage] .....	.....F.	
44	Oct. 15, 1542	[Anchorage] .....	.....F..	
45	Oct. 16, 1542	[Anchorage].....	.....F..	
46	Oct. 17, 1542	[Anchorage].....	.....F..	
	Nov. 2-6, "	El Pueblo de las Sar- dinas.....	.....C..	
	.....	Los Pueblos de las Sardinas .....	.....F.	
47	Feb. 12--14, 1543.....	El Puerto de las Sar- dinas.....	35½°, F..	
48	Nov. 1, 1542	El Puerto de Todos Santos.....	.....F..	
49	.....	El Pueblo de Xexo...	.....F..	
50	Oct. 18, 1542	El Cabo de la Galera..	36½°, C..	
	" " "	El Cabo de Galera....	36° "and more." F..	

THEIR NAMES BY ULLOA, (U), DRAKE, (D), AND VIZCAINO, (V),
AND LATITUDES —CONTINUED.

No.	Present Name of the Place.	Latitude, ° ' "	Correction to C., F. or D.	Remarks.
35	Los Coronados Islands	32 25	—95' F..	
36	San Diego Bay.....	32 40	—100' F..	He has one of the largest errors in the best-known port.
37	Santa Catalina Island.	33 27	.....	At the great depression across the island.
38	San Clemente Island	32 49	.....
39	Santa Monica Bay....	34 00	—60' F..	
	Do			
40	The Anchorage off La	34 05		
	guna Mugu.....			
41	San Buenaventura....	34 17	—63' C..	
	Do.	34 17	—63' F..	
42	Anchorage off "the	34 22	.....
	Rincon".....			
43	Anchorage off "the	34 24	.....	A few miles east of Santa
	Carpinteria".....			Barbara.
44	Anchorage 4 or 5 miles	34 25	.....
	west of Goleta Point			
45	Anchorage off the Cañ	34 27	.....
	ada del Refugio....			
46	Anchorage off Gaviota	34 27		
	Pass.....			
	The Indian Villages at	34 28	.....	Ferrelo says the Indian
	Gaviota Pass.....			name was Cicacut.
	Do			
47	Anchorage off Gaviota	34 27	—73' F..	
	Pass			
48	Anchorage off El Coxo	34 28	.....	There are two Coxo's. The
				Coxo Viejo is one mile
				east of the usual anchor-
				age El Coxo.
49	Indian Village at El	34 29	.....
	Coxo			
50	Point Concepcion, or	34 27	—123' C....	La Punta de la Concepcion
	Point Conception	34 27	—93' "and more" F..	of recent Spanish naviga- tors.

THE LANDFALLS OF CABRILLO, (C), AND FERRELO, (F), WITH
AND THE PRESENT NAMES

No.	Dates, 1542, 1543.	Name of place by Cabrillo and Ferrelo.	Latitude by Cabrillo and Ferrelo.	Names by Ulloa, Drake or Vizcaino.
51	Oct. 14, 1542.	La Isla de San Lucas.	..... F..	
52	" 18 "	Las Islas de San Lucas	.....C. F..	
53	" 25 "	La Isla de la Posesion	... C. F..	La Isla de Baxos. V.
...	Dec., 1542	La Isla de Posesion..	..... F..	
54	Dec., 1542	Una de las Isl s de San Lucas .....	..... C..	
55	Jan. 3, 1543	La Isla de Juan Rod-	.....F.	
	Mar. 5, "	riguez.....		
56	Oct. 25, 1542	El Puerto de la Poses- ion.....	.....C. F..	
57	Mar. 5, 1543	[Dangers].....	F.'s con-ort.	
58	Jan. 29, 1543	La Isla de San Lucas.	..... F.	La Isla de Cleto. V.
59	Mar. 5, 1543	La Isla de San Sebas- tian	F.'s consort	
60	Jan. 19, 1543	La Isla de San Salva- dor.....	..... F..	La Isla de San Am- brosio. V.
61	Nov. 11, 1542	El Rio de Nuestra Señora .....	..... C..	
62	Nov. 11, 1542	Las Sierras de San Martin	37½°, C. F..	La Sierra de Santa Lu- cia. V.

THEIR NAMES BY ULLOA, (U), DRAKE, (D), AND VIZCAINO, (V),
AND LATITUDES.—CONTINUED.

No.	Present Name of the Place.	Latitude, ° ' "	Correction to C., F. or D.	Remarks.
51	The three Islands, Santa Cruz, Santa Rosa and San Mig- uel			They overlap each other, and were seen as one great island.
52	San Miguel, and then Santa Cruz and San- ta Rosa as one.....			One large—Santa Cruz and Santa Rosa overlapping— and one small, which was San Miguel.
53	San Miguel Island...	34 03		Ferrelo says the Indian name was Ciquimuyumu.
...	Do.			
54	Do.			
55	Do.			So named by Ferrelo to commemorate Cabrillo's death on the island.
56	Cuylers Harbor.	34 03		Cabrillo and Ferrelo win- tered here in 1542-43; it is on the north shore of San Miguel island.
57	Wilson Rock, &c.	34 06½		The rocks and reefs off the northwest shores of San Miguel island.
58	Santa Rosa Island...	33 57		Ferrelo says the Indian name was Nicalque.
59	Do.			
60	Santa Cruz Island...	34 02		Ferrelo says the Indian name of the island was Limun.
61	La Purisima, or Santa Ynez River	34 42		Cabrillo and Ferrelo did not see it. They learned of its existence north of Pt. Concepcion, from Indian information, when in the Santa Barbara channel.
62	Sierra Santa Lucia....	36 03	--87' C. F.	This mountain range is 50 miles long, and overhangs the coast line. The cul- minating point is Mt. Santa Lucia, 6,000 feet elevation and 12 miles in- side the shore.

THE LANDFALLS OF CABRILLO, (C), AND FERRELO, (F), WITH
AND THE PRESENT NAMES

No.	Dates, 1542, 1543.	Name of place by Cabrillo and Ferrelo.	Latitude by Cabrillo and Ferrelo.	Names by Ulloa, Drake or Vizcaino.
63	Nov. 11, 1542	El Cabo de San Mar- tin.....	38°, ....F..	La Punta de Pinos. V.
64	Nov. 11, 18, 1542.	El Cabo de San Mar- tin	37½°, F..	
65	Nov. 18, 1542	El Cabo de Nieve, ...	28¾°, C F..	
66	.....	(de las Sierras Nevad- as )	.....
67	Nov. 16, 1542	La Baía de Pinos. ....	.....C..	Portus Novæ Albionis 38°.D.
	.....	La Bahía de los Pinos	39° "and more," F..	El Puerto de San Francisco.V.
68	Nov. 14, 1542	El Cabo de Pinos ..	40° "and more," C..	
	Feb. 25, 1543 Mar. 3, 1543	El Cabo de Pinos....	40°, F..	
69	Feb. 26, 1543	El Cabo de Fortunas.	41°, C..	

THEIR NAMES BY ULLOA, (U), DRAKE, (D), AND VIZCAINO, (V)
AND LATITUDES.—CONCLUDED.

No.	Present Name of the Place.	Latitude.		Correction to C., F. or D.	Remarks.
		°	'		
63	Point Pinos.....	36	32	--88' F.....	
64	The Twin Peaks.....	36	03	--87' F.....	The height is 5,100 feet, and the distance $3\frac{1}{2}$ miles inland.
65	Black Mountain.....	37	09	--91' F.....	The mountain mass 13 miles behind Point Año Nuevo.
66	The Santa Cruz mountains.....				Embracing Black Mountains.
67	Anchorage in Drake's Bay	38	00	--00' D..	The northern part of the Gulf of the Farallones.
	Drake's Bay, or the Gulf of the Farallones	38	00	--60' "and more," F..	"A great gulf," Cabrillo. (Una Ensenada Grande.)
68	The Northwest Cape.	38	31	--89' "and more" C...	The mountain mass just east of Fort Ross anchorage, and reaching 2,200 feet elevation.
	Do.	38	31	--89' F.....	
69	King Peak, behind Punta Delgada.....	40	00	--60' C.	The mountain mass northward of Shelter Cove, with King Peak, only 10 miles inland and 4,235 feet elevation, as the culminating point.

BULLETIN

OF THE

CALIFORNIA

ACADEMY OF SCIENCES.

Vol. 2, No. 7.

JUNE, 1887.



CONTENTS.

	PAGE.
Ocean Currents Contiguous to the Coast of California. C. M. Richter...	337
The Pacific Coast Alders. C. C. Parry	351
West Coast Pulmonata; Fossil and Living. J. G. Cooper.....	355
Studies in the Botany of California and Parts Adjacent. VI. Edward Lee Greene.....	377
Ornithological Observations in San Diego County. W. Otto Emerson...	419
Desmids of the Pacific Coast. Francis Wille.....	432
Fungi of the Pacific Coast. V. H. W. Harkness.....	437
Occultations of Stars by the Dark Limb of the Moon. Geo. Davidson...	448

ISSUED JUNE 16, 1887.



BULLETIN.

No. 7.

California Academy of Sciences.

OCEAN CURRENTS CONTIGUOUS TO THE COAST OF CALIFORNIA.

BY DR. C. M. RICHTER.

Read February 7, 1887.

The question, not as to the existence, but as to the character of the ocean currents contiguous to the coast of California, is still an open one. Some of the most recently published maps show that a cold current of great width washes our shores, and others again indicate that it is the deflected warm Japanese current which is passing this country in its southward movement. A third opinion gives the surface waters to the Kuro Siwo, and identifies the sub-stream with the Polar current.

The practical seaman is satisfied by the knowledge of the fact, that the direction of the waters along the coast—with the exception of those nearest the coast—is generally southward and northward only during the winter storms. Adjacent to the coast—at a distance of from three to ten miles from it—an eddy current is observed with a northerly direction.

It is obvious that it would be of great value to science to gain positive facts concerning these questions, and especially so in regard to the science of meteorology; for the peculiarity of the climate of California must be de-

pendent to a great extent upon the influences of these ocean currents.

We wish to know the width of the eddy current, the temperature of its water, its origin and extent. We wish to know the width of the gigantic southward movement of waters, its velocity and its temperature; whether there is a distinct cold stream and a distinct warm stream, and their relation to each other, etc., etc.

To decide the direction and velocity of an ocean current, various instruments have been invented, and are still in use, which show as much ingenuity in their construction as they lack in positive demonstration. This disappointment is clearly illustrated by the findings on Maury's charts, and the map affixed to the "Deep-Sea Soundings in the North Pacific Ocean obtained on the U. S. Steamer *Tuscarora*, Commander G. E. Belknap."

We find on Chart I* of this essay, that there is a general southerly direction of the surface currents, even next to the coast north of San Francisco. The under-surface currents show no regularity whatever in their direction, and looking at this chart one is led to believe that the direction of the arrows is given for the purpose of proving the existence of a whirlpool in the ocean near the coast of California. *See Chart I.*

Undoubtedly many records as to the direction of ocean currents have been made here by vessels, only to explain apparent errors in their nautical observations as to the course of the ship.

The only fact which emanates from these observations is, that a surface current of a southerly direction drives the waters down the coast, and that by strong winds from the south, during the winter storms, its direction may be temporarily reversed.

*Compiled from Maury's and Belknap's charts.

The velocity of this surface current is marked variously as from 0.37 to 1.0 nautical miles per hour.

It is clear that this evidence cannot give satisfaction to science.

But fortunately we have an instrument from which we can obtain the desired information, namely, the thermometer. The sea thermometer is the most sensitive instrument known with which to prove the existence of ocean currents, as well as to determine their extent.

We have historical proof of an ocean current in the landing of Cermeñon, one of the discoverers of California, who was driven to her shore by the great circuit route of the Kuro Siwo. We have many wrecks of Japanese junks along the western coast of North America to bear testimony to its existence. We have also the records given by modern current indicators, which denote a great southerly drift, and still we lack the positive proof whether this current is of Arctic origin, or coming from the shores of Japan, until we have measured the temperature of its waters on the surface and in its depths.

The great Gulf Stream, its origin, its direction, and its extent, has been definitely outlined by measuring the temperature of its waters.

The questions we wish to solve in regard to the California current must necessarily be also answered by the record of its temperature. The material from which to obtain these records is still very meager.

We find it on Belknap's Deep-Sea Soundings, on Maury's charts, and in the records of steamers and sailing vessels. Commander Belknap made a number of trips along the coast of California in 1873, starting from different points, and following each time a line more or less perpendicular to the coast. His real object was to find a practical route for a submarine cable between the United States and Japan. At the same time serial temperatures were obtained of the ocean water in different depths. These

records of temperature are necessarily imperfect, but as they represent mostly the mean temperatures, taken from four to five observations on the surface, and from more than one in great depth, they really are entitled to great consideration, although the apparent smallness of their number may not seem to warrant it.

Furthermore, the temperatures registered on Maury's charts coincide remarkably with Belknap's figures.

We know the law of the evenness of the ocean temperature. In the open sea the temperature of the surface water shows a daily range of hardly more than one degree of Fahrenheit, and nearest the coast sometimes of two or three degrees. The yearly variation will amount only rarely to ten degrees in our latitude. The surface water at the Golden Gate, for instance, shows between the years of 1874 and 1883 a lowest mean temperature of $50^{\circ}.49$ in January, and a highest mean temperature of $59^{\circ}.68$ in September, according to the "Coast Pilot," by Prof. G. Davidson.

In compiling the temperatures derived from the above-named sources, we cannot make therefore a great deviation from truth.

It is proper to mention the fact, that Belknap's temperatures have furnished the foundation for the most recent descriptions of the North Pacific ocean currents. I refer especially to the work on "Oceanography," by F. Attlmayr, published under the auspices of the Secretary of the Austrian Navy in 1883. Yet no attempt has been made to adapt the figures of the *Tuscarora* to the details of the currents along the coast.

Therefore it has been my endeavor to utilize every reliable record of temperature from Belknap's Soundings, as well as from every other trustworthy source, and to determine by them the facts from which I could illustrate the direction and the extent of the ocean currents along the coast of California.

As the figures recorded by Belknap harmonized as afore-

said wonderfully with those of other authors, the task I had undertaken was very gratifying as to the results.

I must add that Belknap's temperatures were taken at the end of October and the beginning of November, between Trinidad Head and San Francisco, and end of December between San Francisco and San Diego. The correction between the two cannot amount to more than one degree of Fahrenheit.

The temperatures on all my charts represent for this reason the winter season, and to give the figures for the summer they must be increased by from five to eight degrees.

The results of my investigation are made clear by Profiles A-F and Charts II and III. They are as follows:

(1.) The greatest difference in the temperature of the surface water, between San Diego and Trinidad Head, is noticeable nearest the shore. The following table will explain it. *See Profiles A-F.*

	Trinidad Head.	San Diego.	Difference.
10 miles off shore.....	48.5°	59.8°	11.3°
50 " " "	50.2	54.4	4.2
100 " " "	54.0	59.9	5.9
220 " " "	54.8	59.6	4.8

(2.) The temperature increases at the line of Trinidad Head gradually from 48.5° 10 miles distant from shore, to 54.8° 220 miles distant from shore, indicating a difference of 6.3° between the two, while off San Diego the temperature remains about the same.

(3.) The ten miles off shore surface temperature of Trinidad Head finds its equivalent ten miles off San Diego at a depth of 100 fathoms. Following the comparison—that of 50 miles off Trinidad Head agrees with the one 200 fathoms deep 50 miles off shore, and 220 miles off shore the Trinidad Head temperature is found 40 fathoms below the surface on the San Diego line.

(4.) Ten miles off shore the ocean has an average depth of only one hundred fathoms, with the exception of three submarine valleys—one between Trinidad Head and Point

Arena, one between Point Carmel and Point Sal, and one stretching from the Santa Barbara channel towards San Diego. The bottom of the one hundred fathom plateau has an average temperature of 45° .

(5.) Fifty miles off shore the average depth of the ocean is 1000 fathoms. At this distance the existence of a submarine mountainous grade, which is highest in latitude of Point Carmel, alters the isothermal lines of the ocean. The same action on the temperature of the water is repeated, though in a less degree, by another submarine grade tending southward towards San Diego.

(6.) The result is, that the isothermal line of 40° , commencing at Trinidad Head at a depth of about 350 fathoms, and which is found to be off San Diego 500 fathoms deep, sinks off San Francisco to 700 fathoms depth, and off Point Sur still deeper. Therefore, off San Francisco and off Point Sur a greater volume of warm water is found in proportion than at any other point on the coast.

(7.) For the same reason the isothermal lines between the two named points are bent upward, indicating thereby that the direction of the current is generally southward, and that the cold waters are crowded back and upwards by the submarine mountain.

(8.) All the isothermal lines, 50 miles off shore, show generally a constant increase of temperature towards San Diego; still the isothermal line of 40° is only 100 fathoms deeper at San Diego than at Trinidad Head.

(9.) One hundred miles off shore the same regularity is observed. On the line of San Francisco, however, the high surface temperature of 58.2° is cooled 18° inside of 300 fathoms depth, and off Point Carmel and Point Sal, a similar proportion is observed; while off San Diego a depth of 600 fathoms is reached before the temperature is lowered to this extent.

(10.) Two hundred and twenty miles distant from shore the evenness of the isothermal lines is remarkable, indica-

ting a slow but constant increase mainly of surface temperature towards San Diego, and in conformity with the general law of temperature of the ocean.

(11.) The isothermal line of 35° is uniformly found at the depth of 1,000 fathoms from 50 to 220 miles off shore.

(12.) The lowest temperature of the water, 32.9° , is found 220 miles off Trinidad Head at a depth of 1,800 fathoms. At the same distance from San Diego a temperature of 33.8° is found 2,260 fathoms deep.

(13.) Off San Diego the temperature of the surface water is highest nearest the shore, while the reverse is true off Trinidad Head.

(14.) The analyzation of all the surface temperatures proves the existence of a cold water current, about 150 miles wide, on the northern boundary line of California, passing southward nearest the coast line, which is reduced in width constantly during its course, until it reaches Point Concep-tion, where it is partly deflected to the southwest and partly buried by warmer surface waters. Its temperature is from 45° to 50° in winter time nearest the coast, before Point Arena is reached, and from 50° to 55° further off the coast and until it is submerged north and northwest of the Santa Barbara channel. *See Chart II.*

(15.) To the west and south of this cold current appears a great body of warmer water, having a temperature of from 55° to 60° in winter time. Its direction seems southerly in the north of California, and is doubtful in the region of Southern California.

(16.) The temperatures of the water 10 fathoms below the surface, generalized on Chart III, demonstrate the accuracy of the foregoing conclusions. For a cold current which comes to an end near the southern part of California must necessarily lose its width by submerging, and we find on Chart III indeed a constant widening of this cold current, and may prove by it again the character of its deflection. *See Chart III.*

Having established the existence of these currents by reference to the temperature of the ocean in its different depths, as found principally by Commander Belknap, the next question arises whether my deductions are in accordance with the balance of observations made by him and other scientists in regard to the temperature of the waters adjoining the California currents.

It is an interesting fact, that midway between Ounimak Pass (Aleutian Group) and Cape Flattery, the temperature at the bottom of the sea, 2,000 fathoms deep, is 2° higher than we noted it for the line of Trinidad Head. In Lat. $54^{\circ} 21' N.$, Long. $155^{\circ} 07' W.$, it was 34.1° at a depth of 2,850 fathoms, and the same at a depth of 1,500 fathoms.

Then, again, on a line between San Diego and Honolulu, and especially near the latter place, the bottom temperature of the ocean is from 33.2° to 33.5° at a depth of 2,800 fathoms and more; therefore lower than near the Behring Sea. To interpret this fact I quote a notice by Commander Belknap, accompanying his Profile C. "Between Cast A (towards Yokohama) and Cast B (towards Tanaga Island of the Aleutian Group), there appears to exist a stratum of cold water of about 35° at an average depth of 34 fathoms below the surface, and becoming deeper as it proceeds westward."

Belknap's charts show the isothermal line of 40° between Yokohama and Ounimak Pass, to be nowhere below 100 fathoms from the surface, the entire length of the Profile, excepting nearest Japan. This would indicate that the Kuro Siwo drift cannot extend to the latitude which is marked for it on the latest maps, the Austrian Navy map included.

It is apparent from Belknap's observations, that the northern or Arctic currents are powerful enough to alter the direction of the Japanese current materially. They sweep against the warm waters, as the Polar waters meet the Gulf Stream on the north of Scotland. The Arctic waters pre-

dominate on the surface by superior force until the Kuro Siwo gives a stronger wall, which causes the cold current to pass underneath in the direction of the equator.

One or more branches of the Arctic current perhaps pushes eastward towards North America, and we find one such branch marked on the Austrian map as passing down nearest the coast and disappearing at 40° Lat. Our map indicates that this cold current is continued to Point Conception.

The bulk of the Kuro Siwo trends eastward, but perhaps nowhere washes the shores of the United States, being separated from them by the narrow cold stream, and yet being near enough to exercise a powerful influence on her climate. Thereby it is also explained why 200 miles from Honolulu the isothermal line of 40° is at the same depth as we found it off Trinidad Head, and even at a greater depth near San Diego, where the warm waters are no longer affected by a cold current.

Therefore, if we can establish a harmony of our conclusions with the balance of the observations in regard to the northern drifts, we are faced by difficulties in attempting to explain the state of affairs on the line off San Diego. After the cold stream is submerged off Point Conception, we are confronted with a body of warm water which can hardly owe its temperature to the influence of the Kuro Siwo.

How could the cold current be deflected southwestward, if a potent warm stream from the north were pushing against it? How could we account for the great prevalence of seaweeds off the shore of Southern California, if a strong drift were working on these waters?

How could tropical and subtropical fish be found on the adjoining coast, if the Kuro Siwo really had superseded the cold current? Is there not a warm current flowing northward?

To decide this question beyond doubt we need a careful

examination of the ocean temperature off the coast of Lower California, and regret to say that reports are wanting.

We are not less ignorant of the ocean temperature next to the coast of California within the sphere of the so-called eddy current. Of course we have regular observations of the ocean water next to San Francisco, and perhaps to Santa Cruz, Monterey, Santa Monica and San Diego. But they will never determine the width and the character of the eddy current, the existence of which and the northerly direction of which is vouched for by Prof. G. Davidson in his "Coast Pilot" (Manuscript, 4th edition).

Undoubtedly such a current exists, at least to some extent, along our coast, for our coast vessels sailing northward know how to profit by it in keeping close to the shore. We have seen the muddy water of the Sacramento river driven northward as a distinct stream for many miles. We have heard of a part of a wreck, located near the Cliff House, being found not many days after the accident near Eureka, Cal. But still we are doubtful as to its existence, as to its extent, and as to the persistence of its direction.

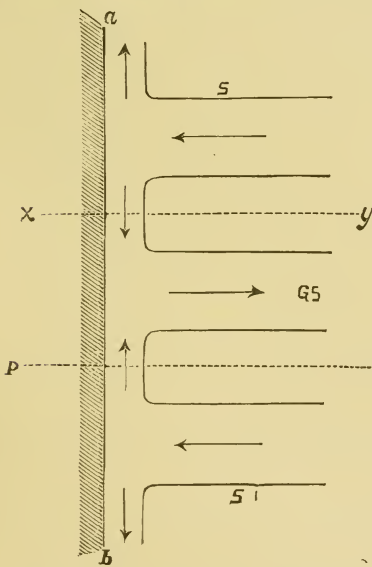
As we are void of scientific proofs to corroborate any assertions in regard to this matter, we have to recur to theory, and fortunately meet with the very plausible one of K. Zeeppritz on ocean currents. He shows by exact physical analysis how superficial impulses will work on liquid masses, and will be extended by the friction of the strata of the liquid against each other downward. He elucidates by his researches that the motion of the principal body of a liquid mass, which is subject to a periodically changing surface power, is determined by the average velocity of the surface, and that the periodical changes penetrate only a thin surface stratum.

Thereby the winds are reinstated as powerful motors of the ocean surface water. They communicate their average direction to the lower masses of the water as well as to the surface water, and Zeeppritz has calculated, for instance,

that a body of water with a depth of 2,000 fathoms, and of infinite extension, would have adopted in 200,000 years the same motion in a horizontal direction as the surface water, provided that a constant motion of the surface water in this direction had been in force.

Before we apply this theory to the currents, which were established by my conclusions, I wish to refer to another essay of Zoeppritz on the configuration of the coast and the formation of the bottom of the ocean as factors, by which the direction of an ocean current is mainly influenced.

I will try to explain his view on this subject by the following diagram taken from his publication:



If a straight coast line ab be touched by two currents s and s' , which have the same velocity and the same width, then those parts of them which are deflected inward, will form a new current Gs between the two former ones, and give it the opposite direction.

It is clear that if a current strikes such a coast line in an oblique direction, as we find it on our coast according to my maps, a deflection of this liquid mass will follow principally in one direction, the one opposite to the original direction of the current.

If we admit that the general direction of the cold and the warm current along the coast of California is southeasterly, then the force and direction of this large body of water will cause an eddy current running northward.

Taking into consideration the formation of the coast, which, as I mentioned before, forms a plateau stretching out into the ocean to a distance of about ten miles from the coast, and thereby creates a shallow strip of water with a depth of about 100 fathoms, while it then glides rapidly into a depth of nearly 2,000 fathoms, it is apparent that this marginal plateau will be the scene of this eddy current.

It now remains to prove that the average direction of the wind along the coast of California, as well as northwest of our coast, is in harmony with the direction of the currents, as indicated on my charts.

H. Mohn's charts, as well as Attlmayr's, concur with Maury's in giving to the winds which blow over the area of the Kuro Siwo, an average direction corresponding to its course, as we adopted it. They all vary in regard to the direction of the wind next to the western coast of the United States. We have to recur therefore to the observations made at coast stations of the Signal Service, United States Army. Undoubtedly we can judge from these reports with some accuracy the prevailing character of the wind for the 50 or 100 miles of ocean surface adjacent to the stations.

The following table, derived from Appendix 51 of the Annual Report of the Chief Signal Officer for the year 1885, gives the desired information. It is computed from the commencement of observations at each station to and including December, 1884:

STATIONS.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tatoosh Island, Wash.....	E	E	E	E	SW W	S W	S W	S W	E	E	E	E
Canby, Fort Wash.....	E	N	W	W	W	W	W	W	S	S	S	S E
Cape Mendocino, Cal.....	NW	NW	SE	NW	NW	NW	NW	N	N	N	S E	NW
San Francisco, Cal.....	N	W	W	W	W	S W	S W	S W	S W	S W	NW	N
Los Angeles, Cal.....	NE	NE	W	W	W	W	W	W	W	W	N E	N E
San Diego, Cal.....	NE	NW	W	W	W	W	W	W	NW	NW	NW	N E

The western coast of the United States tends northeastward from Cape Mendocino towards Tatoosh Island, and southeastward from Cape Mendocino towards San Diego. Therefore a current with a direction down the coast will depend on easterly winds near Tatoosh Island. These winds will become northwesterly only when it has reached Cape Mendocino, and they will become more and more westerly in the direction of San Diego. This is exactly what the table demonstrates.

We may infer besides, that as the direction of the Kuro Siwo, and the wind above its area, is westerly between Lat. 40° and 50° , its waters will have a general direction towards Cape Mendocino, and that the current which follows the easterly winds off Tatoosh Island cannot be a part of the Japanese, but of an Arctic current. This brings again the currents as represented on my charts in harmony with the observations at the Signal Service stations, and with the theory of Zoeppritz.

It is hardly necessary for me to emphasize the importance which my deductions, if correct, bear upon the climatology of our State.

The mountain barriers of our State which shield us from influences by land, and the evenness of the temperature of the neighboring ocean, guarantee the uniformity of our climate.

A glance at the accompanying charts exhibits the reason why the northern part of California has more fog in summer, and probably more rain in winter; it explains the reason why the temperature of San Francisco cannot sink as low as that of Monterey; it reveals the causes of the subtropical climate of Southern California.

We get from these profiles arguments for a parallelism between the isothermal lines, and perhaps the isobares of California, with the corresponding lines of the neighboring ocean. In short, they teach us graphically the importance

of the ocean currents as factors in determining the climate of our State.

Furthermore, they prove the advisability of our Government, through its branch the Signal Service, continuing this research. The isothermal lines of the ocean for different months at different distances from shore and along the entire west coast of the United States, should be established beyond doubt. They will form the constant factor for the calculations of our meteorologists. They will probably explain the formation of our barometric maxima and minima, and will enable us to make weather predictions with more accuracy than it is possible to do without them.

THE PACIFIC COAST ALDERS.

BY C. C. PARRY.

Read March 7, 1887.

The alders, everywhere easily recognized as a natural group of shrubs or trees, usually bordering water-courses, present certain well-defined botanical characters comprised in the old established genus *Alnus*.

Widely scattered over different portions of the globe, the species, variously estimated at fourteen or fifteen, are not so numerous as to present serious difficulties in systematic arrangement. As one would naturally expect, the species most remote in geographical position present the most marked specific differences, as is manifest in the Asiatic-India group, as compared with those of Europe or North America. At the same time, several of the high northern species have a wide geographical range, in some cases apparently encircling the globe; and one, at least, *Alnus maritima*, Nutt., falls into that singular group connecting the botany of Eastern North America with Japan.

On this coast the Botany of California enumerates four species; one of these, confined to the higher mountain districts, is recognized as a variety of the common Eastern United States species, *Alnus incana*, var. *viridescens*, Watson.

Another well marked species, *A. rubra*, Bong., seems peculiar to the North American Pacific coast, ranging from Alaska to Central California, and apparently confined to the coast districts. Some fine specimens of this latter can be seen along the course of deep ravines in the vicinity of Berkeley.

Of the two other recorded species to be considered, viz: *Alnus rhombifolia*, Nutt., and *A. oblongifolia*, Torr., which,

under favorable conditions of growth, present the largest trees known in this group, frequently attaining a height of eighty feet, with a smooth columnar trunk three feet in diameter at base—observations during the present season have brought to view such peculiar and hitherto unnoticed botanical characters as to justify their presentation before a meeting of the California Academy of Sciences.

It must be premised that Nuttall's original description of *Alnus rhombifolia*, contained in Am. Sylva., Vol. II., p. 49, was taken from a leaf branch without flower or fruit, collected by Nuttall himself in the vicinity of Monterey, probably in April, 1836. Since then the name has been generally, and no doubt properly, applied to the common California alder, of the western and interior districts, extending from Oregon to Southern California. As such, it is included by Watson in Bot. Cal. II. p. 80.

Probably about twelve or fifteen years later than Nuttall's description above referred to, Dr. Torrey, in the Botany of the Mexican Boundary Survey, p. 204, described *Alnus oblongifolia* from specimens collected by C. Wright in New Mexico, the specific character being mainly based on the foliage; subsequently Mr. Watson identifying Dr. Torrey's species with the Southern California *Alnus*, included *A. oblongifolia*, Torr., in Bot. Cal. p. 81. In making a critical comparison of the description of these two species as given therein it is noticeable that the points of difference are very slight, and might easily be comprised within the limits of ordinary variation.

An equal difficulty has been experienced by field observers, and from a somewhat extended observation for several years, I have never yet been able to draw a clear line of distinction between these two species as laid down in botanical works. Accordingly, in order to satisfy myself on this doubtful point, I have undertaken the present season to make a series of observations, including the earliest growth and flowering, some of the results of which thus far reached, may be briefly noted.

First, then, in reference to the species under consideration, the most striking fact is the unusually early period of flowering, equally true of the most southern and northern plants. Thus no sooner do the leaves of the previous season, having fulfilled their office of nourishing the forming buds, begin to fade and loosen their attachment—though often retaining their hold until early winter—than the flowering spikes both staminate and pistillate begin to swell, and by early January the male catkins are fully developed, and the stigmas protuberant. In spite of occasional sharp frosts the process of fertilization proceeds, and by February 1st, at least as far north as the lower Sacramento valley, is mainly completed; the swollen winter streams over which they lean, as well as the adjoining banks, being copiously strewn with the effete male tassels resembling torpid caterpillars.

During all this active vital process, the leaf buds remain dormant, mostly retaining their deciduous scales. Thus, during the month of February, the trees display their smooth naked branches, barely relieved by the matured seed cones of the previous season, which, with the winter rains, relax their scales to discharge their wingless seeds; a remarkable contrast to the more exclusively coast species, *A. rubra* which at the present time, March 1st, is only just loosening its male catkins in connexion with the rapidly swelling leaf buds.

Still farther, a close examination of the male catkins thus early developed, shows a floral character hitherto unnoticed, applying equally to the northern and southern forms, which will require an extension of the generic character of *Alnus* as laid down in systematic botanical works. Thus in the latest authority, Benth. & Hook., Gen. Pl. III, p. 404, the staminate flowers are described as with "four stamens and very short filaments." Now in the species under consideration, while in other respects agreeing closely with the ordinary characters

of the genus, the four somewhat unequal perianth segments enclose quite constantly but a pair of opposite stamens, not infrequently increased to three in the larger perianths, and more rarely reduced to a single one, and instead of very short filaments, they are at maturity exert beyond the perianth.

This character is so obvious on the most casual observation, that the only explanation of its having been heretofore overlooked must be the fact that in the specimens from which the descriptions were drawn, the male flowers were either wanting or not examined.

As the character thus noted serves to give a unique feature to all the various forms of *Alnus* heretofore included under these two described species, and is easily recognized in all the specimens accessible to me, including an undeveloped one in the California Academy herbarium, collected by Prof. Greene in New Mexico, I am led to the conclusion that all these western forms, varying only in unimportant leaf characters, must be reduced to the earliest described species, *Alnus rhombifolia*, Nutt.; *A. oblongifolia*, Torr., representing the most southern and eastern variety.

Another fact in this connection, coming quite accidentally under my observation—more of morphological than systematic botanical interest—is a singular abnormal condition in which some of the lower staminate aments show a transformation at the summit to regular pistillate flowers. While to ordinary view such a transformation of floral organs, involving absolute sterility, and accomplishing no apparent useful purpose in the vegetable economy, may be poetically regarded as a “freak of nature.” It is nevertheless true that by just such abnormal deviations from ordinary processes, nature often gives us the clearest insight into her regular plan of operations, though it may need the genius of a Goethe to interpret their real significance.

The whole subject suggests the value and importance of supplementing or correcting systematic descriptions by careful and intelligent field observations.

WEST COAST PULMONATA; FOSSIL AND LIVING.

BY J. G. COOPER, M. D.

Read March 21, 1887.

A.—EXTINCT SPECIES.

Since the publication of the article in Bulletin No. 4, p. 235, several additional facts have been made known which much increase our knowledge both of fossil and living species.

The most ancient known fossils of non-marine mollusca in North America were those of the carboniferous strata of Nova Scotia, and were of terrestrial forms. Some late discoveries by the U. S. Geol. Survey "from the base of the carboniferous of Nevada," give two fresh-water species, and one of an amphibious or brackish-water type, allied to our *Alexia*. (See "Science," II, p. 806, 1883, and Bulletin U. S. Geol. Survey, No. 18, 1885.) These species show both a wonderful similarity to living species, and an unexpected variety of genera existing in what is so far the oldest land fauna known.

In the last-named Bulletin, Dr. White also figures an extinct *Unio* and an extinct "*Helix*" (*H. dalli* Stearns, referred doubtfully to *Mesodon*) found in the John Day lacustrine basin of Oregon, together with three other species of land-shells, of which two are inseparable from living species now found only farther west, viz.: *H. fidelis* of Oregon, and *Gonostoma yatesii* of California. The third is doubtfully referred to the eastern species *Patula perspectiva*.

These are the most important evidences yet discovered of the westward migration of the Pacific-slope species, being now found only at 100 miles west and 500 miles south of the locality of the fossils, in regions very different in climate, being far more moist.

The deposit in which they were found is considered miocene from the bones of extinct mammalia found in it, and the land shells help to confirm this.

The extinct *Mesodon* seems to be the ancestor of the species found in the regions north and westward, though not very similar to any of them, while the close resemblance of the other two western forms to living examples is remarkable, for fossils so far anterior in time. The *Patula* is the only one generically allied to the numerous forms of that type now existing in the "Central Province," but unlike them all.

The isolated occurrence at present of the *Gonostoma* about the caves of Calaveras County gives a clue to the explanation of the similar isolation of several other west-slope species, such as *Polygyrella* in Montana, and *Polygyra harfordiana* in Mariposa County, Cal., which may also have ranged widely during the tertiary epochs.

Other geological evidences show that since the miocene epoch the Cascade Range and Sierra Nevada have been elevated much higher than before, together with the "Central Province" east of them, while at the same time vast outflows of lava devastated the latter regions. These shells tend to prove that at the time they lived in Central Oregon, that region had a much moister and milder climate, like that now found west of the Cascades, and at a gradually rising elevation on the west slope of the Sierra Nevada, as we progress southward.

They also make it appear probable that any terrestrial fossils found west of those ranges should be considered as pliocene or later, although we have fresh-water bivalves in the lignitic beds of Mt. Diablo, and it is possible that the forests producing the lignite also contained eocene or older land shells.

B.—GEOGRAPHICAL DISTRIBUTION.

It would be interesting to continue the subject of derivation from fossil species down to the present time, if we had

sufficient data to follow it out, but until more is learned we can only infer part of it from the present distribution and variations of the living species.

In 1869, I published what was then known on the subject, and again, in 1873, gave the special distribution of our banded species and varieties with maps, in the Proc. Cal. Acad., V, 121. Some additional information and corrections have since then been accumulating, especially with regard to the region around San Francisco Bay, which is the only well-explored region of land shells on the west slope, and apparently the richest in variety of species, subspecies etc., of any north of lat. 32° on this side.

1. SIERRA NEVADA.

In addition to what has been stated as to the occurrence of the large Helicoids on the west slope of these mountains only below the elevation of 5,000 feet, probably on account of the absence of lime in a proper amount or condition higher up, it must be noticed that the crystalline limestone is not always sufficient to insure their existence even when climate and moisture are favorable. As will appear later, the lime must be a part of the soil, as the mollusca only obtain it through the vegetation growing in that soil. But above the limits of the large species there is found a group of small, often minute species, rare lower down, which shows that sufficient lime exists in the vegetation above the limestone strata to supply the little they need; and this doubtless comes from the less calcareous rocks, including the volcanic.

These small species include what are conveniently grouped as Vitrinoid and Succinoid species, which are found chiefly from 5,000 to 6,000 feet altitude in the mountains near lat. 39°. Above that height I found no land shells; though the bivalve *Pisidium occidentale* exists in the railroad pass at about 7,000 feet. From there up to 9,000 feet, where patches of snow lie permanently on Mt. Stan-

ford, about lat. $39^{\circ} 25'$, although the summer months are warm and moist, no traces of them were found. As the permanent snow is no doubt proof of a nearly constant night temperature of 32° , and frosts are frequent during summer down to 6,000 feet, we may consider these as the causes of the absence of any mollusca. It is evident that this limit must vary much in different parts of the mountains, as snow does not lie permanently below 10,000 feet on Mt. Shasta, lat. $41^{\circ} 28'$, nor below 11,700 feet on the "High Sierra," lat. $36^{\circ} 30'$ to 38° , according to late explorations of the U. S. Geol. Survey.

The wide gap in the northern Sierra referred to in the last article (Bull. IV, p. 251), in which no land-shells were known to exist for 100 miles north of Yuba river, has been partly bridged over by the discovery of several at Quincy, Plumas County, by Mr. W. J. Raymond. At an altitude of 3,383 feet, or near it, he found (1) a *Mesodon* (*Aplodon*) called by Mr. Binney an aberrant form of *M. armigerus* Ancey, or possibly new (no doubt the one reported as "Columbianus" from Calaveras Big Trees). Also (2) *Patula* (*striatella*?) *cronkhitei* Newc., (3) *Pupilla corpulenta* Bld., (4) *Vitrina pfeifferi* Newc., (5) *Succinea oregonensis* Lea. (6) *S. nuttalliana* Lea., (7) *S. stretchiana* Bld. That elevation is therefore about the dividing line between the large and small groups near lat. 40° . It is true that none of the large banded species occurred, as they do up to 5,000 feet toward the south, but No. 1 belongs to a medium-sized group more numerous toward the north, while Nos. 2, 3, 4 and 7 are all of the subalpine group in California, and 5 and 6 rare in the lower Sierras, though common near the coast up to 3,000 feet. Several of them were before known from the same county and southward; in fact all except Nos. 1, 5 and 6.

Respecting "*Macrocyclus*" *vancouverensis* from the Sierras, mentioned on p. 247, I have seen dead shells apparently of that species from Calaveras County, near Cave City at

nearly 1,600 feet altitude, and others from Fresno County, and near San Diego, both being of the large Oregon form, unlike the small form, so-called, existing in the northern California coast ranges, where it is the size of *M. sportella*. Considering that the banded species of the Sierra extend toward San Diego along the coast, the large form seems to have reached there by the inland route, and not by the coast range of mountains.

It may be remarked that toward the southern end of the Sierras even the Vitrinoid species seem limited to a narrow belt at about 5,500 feet, none being known in the High Sierras above there, nor on the lower slopes; while at Tehachapi Pass none occurred at any elevation below 4,000 feet. Still there seems no reason why they should be absent on the higher slopes up to near the snow line, as they were found in the Rocky Mountains to 9,000 and 11,000 feet by E. Ingersoll.

The large species of the lower elevations also seem to become scarcer on these southern parts of the range, apparently because the lower parts are too dry and the higher too cold for them, but search has not been made carefully enough to prove this. The White River locality is the only one known for 150 miles, though they no doubt occur at intervals nearly all that distance.

While a very interesting group of species was found by Harford and Dunn at the Mariposa Big Tree Grove near 5,500 feet altitude, near lat. 37° 30', none have been reported from Yosemite Valley at 4,000 feet, and few farther south. As the most extensive list of the southern Sierra species yet known, I here publish it for the first time.

A. Vitrinoid species: 1. *Hyalina arborea*; 2. *Conulus fulvus*; 3. *Patula striatella cronkhitei*.

B. Helicoid species: 4. *Helix mormonum* (small); 5. *Helix traski franki* (dwarfed); 6. *Helix tudiculata* (dwarfed); 7. *Triodopsis loricata*; 8. *Polygyra harfordiana*, (9 miles south, in the Fresno grove.)

C. Pupoid species: 9. *Pupilla corpulenta*.

D. Succinoid species: 10. *Succinea stretchiana*.

The other species of the Sierras have been named in several previous articles, being about fifteen besides those here named. (See Binney's 2nd Suppl. to Terr. Mollusks.)

Of this list Nos. 1, 2, 3, are well-known to be widely spread in the Northern States, No. 7 found also in the coast range of California, Nos. 9 and 10 only in the Sierra Nevada, and No. 8 so far only near this locality. No. 4 was traced south only about 50 miles by Voy, No. 6 to about lat. $32^{\circ} 30'$, while No. 5, very small here at its northern limit, becomes "common in the foothills a mile or two north of Posé creek" (Gabb), as the larger variety *carpenteriana*, and continues to Guadalupe Island, Lower California.

Thus it appears that Nos. 4 and 5 overlap in their range for at least 50 miles, and are found together for that distance unconnected by intermediate forms, though both can be connected with *H. fidelis* by links now existing north and west. It seems to me, therefore, that No. 5 must either have reached this N. E. corner of its range from the direction of the fossils of Eastern Oregon, by way of the east side of the Sierra Nevada (the connecting chain being now extinct there) or has come from the south and westward, thus reversing the usual course of migration. For it is well known that the Sierra Nevada are much older than the Coast Mountains, and that the latter are older toward the north than the south, thus compelling a southward migration among all land animals during their gradual extension over the country. However this question may be looked at, No. 5 is unlike any other of the Californian banded *Helices* in crossing the southern end of the valley between the two ranges of mountains, reappearing on the *east* slope of the Coast range 58 miles farther south, upon tertiary fossil limestone, at an elevation of about 4,000 feet, where no other species is known to occur, near the summit of the Uvas

Pass, now more like the form first described as *H. traski*.

This form was from Los Angeles, or the mountains near there, about 60 miles farther southeast, but is abundant in many spots along the whole coast slope in that direction, with much variation in size and convexity but uniform in color. Being often found throughout this range in company with No. 6 (but never with connecting forms), as far south as San Diego, it shows that the region has been colonized from the Sierra Nevada with these animals, although the geological structure indicates the period of elevation to have been of very late tertiary or post-pliocene date near the coast. On Santa Rosa Island it seems to have changed to *H. ayersiana*, a rare connecting link having been found near Santa Barbara by Dr. Yates, but on other islands of the group it is represented by the nearer allied *H. rufocincta*, and may perhaps have been the original stock from which the very much dwarfed var. *gabbi* and *H. fucta* were derived. On Coronados Island, Lower California, it is however like var. *carpenteri*, and on Guadalupe Island Mr. W. E. Bryant found a form more like that of Lower California peninsula, once confounded with *H. remondi*. Mr. G. W. Dunn informs me that *H. fucta* is also found on Guadalupe Island, and the very peculiar Helicoid, *Binneya notabilis*, has been found there by Mr. Bryant, as well as on the peninsula by Mr. Orcutt. The latter also reports *Pupa ovata* from near San Diego, and *P. arizonensis* from under Yucca logs on the east slope of the mountains, which are thus connected with the Arizona fauna, as I stated in the Amer. Jour. Conch. IV, 217, 1869, though there was some doubt then of its occurring in California. No other new facts on distribution toward the southward have come to my notice.

2. THE COAST RANGES SOUTH OF MONTEREY.

It is to be observed that while the Sierra Nevada are to a great extent cut off from the direct force of the sea breeze except near the middle, their higher parts are so much above

the top of the Coast range that they receive more moisture in winter and are no drier in summer, but the foothills below 3,000 feet are both hotter and drier. It thus happens that most of the land shells are to be found from that elevation up to 6,000 feet, and though washed down by the streams, can only exist in the foothills, in places either marshy or springy, or sheltered by rocks, trees and caverns.

But we find two of them, Nos. 5 and 6, of the last list, becoming common down to the sea in the counties south of lat. 35°, the valleys there being open to the sea breeze and less heated or dried up in summer, although the annual rainfall is much less than in the Sierras. They there attain their greatest perfection, and No. 5 becomes much varied, assuming forms on the islands, claimed to be distinct species. Following No. 5 toward the northwest it changes still further, for near Point Conception Dr. Yates obtained a form of large size but with nearly the same dark color as that of *H. dupetithouarsi* combined with the sculpture of *H. traski*. It has, in fact, nearly the same size and form as the figure of the former copied by Binney from Deshayes, but which was described as colored like *H. fidelis*.

Fifty miles farther north Mr. Raymond found a form like No. 5 in color but with the wrinkled epidermis of the Monterey shell, and at San Simeon, 90 miles north, smaller specimens exactly like those from Monterey. So there is here a transition by graded varieties between the two, much as in the links connecting *fidelis* with *infumata* near Humboldt Bay. Still there is a geographical limitation of each leading form, indicating the probability that these links may be hybrids, or not truly species, they being very variable, while the species are quite uniform over wide tracts of country. They are parallel cases to the numerous varieties of *Patula strigosa*, which within a limited range are found in great numbers, so variable in size, form, color, and sculpture, that scarcely two are alike.

These discoveries extend the range of *H. dupetithouarsi*

to 135 miles south of Monterey, where only it was supposed to be found. It is thus limited to the narrow strip of steep, rugged country, forming the west slope of the Santa Lucia Mts., which is a ridge about 20 miles wide close to the sea, and 4,000 to 6,000 feet high, receiving most of the moisture from the sea winds and cutting it off in great degree from the valleys eastward, as well as from the parallel and lower ranges of mountains for about 50 miles eastward, and from much of the highest portion of the Sierras. The only terrestrial Pulmonata known in these arid valleys are Succineas wherever marshes or springs are permanent.

It has been long known that a variety of *H. traski* was found near Paso Robles at the south end of the Santa Lucia range, 25 miles east of San Simeon, and several hundred feet high on the east slope. I included it in the description of *H. diabloensis* in 1872, though somewhat different from the northern type, but since then have considered them all as varieties of *H. traski*. It is evident from the varieties already mentioned, that the distinctions between these and *H. dupetithouarsi* become more decided towards the south and east, or towards a drier and hotter climate. But the anatomy of the animals is stated by Binney to be so different that unless these connecting links show an intermediate animal there should be no confounding of the two in one species. The animal of var. *diabloensis* is described by Binney as very near that of *traski*. It is however still unsettled whether the internal structure of these animals is less variable than the external. On account of the great aridity of the valleys for 216 miles N.W. of Uvas Pass, which the main routes of travel traverse, no species seem to have been found on the east slopes of the Mt. Hamilton range 50 to 60 miles from the sea. But as No. 5 is found at the pass 45 miles inland, it is possible that the same, or a variety of it, exists above 4,000 feet even in this arid range. Paso Robles is 108 miles distant from Uvas Pass, but nearer the coast and at the head of the

Salinas valley, which no doubt contains them throughout, as Dr. Yates found them living at the river crossing, 90 miles northward, near Monterey Bay. There is a gap of 70 miles from there to Cedar Mountain where the species has not been found, nor indeed any other more than 25 miles east of the coast, but this must be on account of no search having been made thoroughly enough. It seems also quite probable that links between *H. traski* and *H. mormonum* will be found in the Sierra Nevada.

3. THE BAY REGION, LAT. $36^{\circ} 30'$ TO $38^{\circ} 30'$.

I now come to the most productive region in California as to Land Pulmonata, about 45 out of 80 forms known in the State being found in it, having been the most thoroughly searched and naturally having the most suitable conditions for this superiority in numbers. I give a map, copied from the State map of Prof. Whitney's Geological Survey, with the exception that the elevations are indicated by contour lines of 500 feet each, and the heights of the measured peaks given in feet, with some corrections furnished by Prof. Davidson of the Coast Survey. Being triangular in form and approximately 150 by 96 miles in extent, it comprises about 7,200 square miles of land. Of this I have myself traversed carefully more than half on foot or horseback, especially the mountainous parts, when working out the geology of the "Bay Map," which includes four-sevenths of the land here given. The northeast marshy and flat corner of the region, about 870 square miles in extent, is not known to produce any but the amphibious Succineas, except a few washed down by mountain streams, which survive along the borders of the marshes for a short time, and might increase if not trampled on by cattle in the dry season.

This region lies directly west of the most elevated portion of the Sierra Nevada, which also produces the greater part of the Pulmonata characterizing that range, as mentioned previously. The same influences affect both regions

to a great extent; that is, the great gap in the coast ranges made by the outlet of the two chief rivers of California, allows the sea breeze to penetrate freely to the interior, carrying moisture and coolness high up on the Sierra Nevada. There are other "wind-gaps" at Monterey and Bodega Bays, by which the wind passes less freely through the Coast range.

Previous to 1869, when I wrote the article on the distribution of our land shells for the American Journal of Conchology, I had collected along the coast border and in the Santa Cruz Mts. up to about 2,800 feet altitude. As then stated, judging from what was known of their distribution in the Sierra Nevada and Rocky Mts. of Montana, I supposed that the coast range must be well stocked up to the summits with these animals, as lime in fossil beds and plenty of moisture, with no permanent snow, were known to characterize them almost everywhere. But the real distribution has proved so different in the bay region, that I am induced to describe it in detail for each county, taking them up as they are situated—in general—east, south, west and north of San Francisco Bay. The list of species here given is arranged to show this distribution, and to save repetition of names, the species are referred to by numbers. Of this list 15 species are nearly or quite identical with Sierra species, six of them indeed being of that boreal group, in great part circumpolar, which doubtless reached both ranges from the north. The largest is *M. armigerus*, which differs considerably in the Sierras, as far as known, but being quite small, gives little room for specific distinctions, as is also true of the remaining species, which are of the simpler, plainer groups. These identical species are marked *. The most interesting of the species is *H. diabloensis*, as the nearest approach to a proof of the derivation of the Coast Range banded *Helices* from Sierra Nevada species north of lat. 35°. But although it might have been derived from shells washed down the San

Joaquin River from near its head in lat. 37° , that would not have carried it north of San Francisco Bay, and it is known up to lat. 39° on the east slope of the Coast Range, while none like it occur near branches of the Sacramento River eastward. From this I argue that it has either spread from the Coast Range east, or that the forms of each range were derived by changes caused by climate, etc., from the Oregon shells of the same group. More numerous comparisons and dissections of connecting links will be required to decide on the true limits of the species and sub-species.

In the region between Monterey and lat. 35° there are no traces of any forms connecting the only Sierra *Arionta* (*tudiculata*) with those nearest allied to it, which all exist within the limits of the Bay region here given. The same objection applies to the theory of their derivation from shells washed down from the Sierras, as in the previous case, especially as they are known along the coast up to lat. 41° at least. (See article on the law of Variation in the Banded Helices, in Proc. Cal. Acad. VI, 121, 1873.)

The names of localities given on the map are referred to in this article, or in former papers, and to prevent confusion names of towns are omitted, but their locations being marked, they can be easily recognized. The essential outlines are nearly correct, except the position of Mt. St. Helena, the summit of which is nine miles north of the limit of the map, and being in the volcanic region is only given to show the increase of elevation in the country toward the north, as the size of the pages would not admit of including any more of the map in that direction, nor was it needed to illustrate the text. The heights given with exact number of feet are accurate; others, as 300, 2,600, etc., are only approximate.

LAND PULMONATA FOUND AROUND SAN FRANCISCO BAY.

A. LIMACOID.

		N.	E.	W.	S.
* 1.	<i>Limax campestris</i>	*	*	*	*
† 2.	“ <i>agrestis</i>		*		
† 3.	“ (<i>Amalia</i>) <i>hewstoni</i>		*	*	*
4.	<i>Ariolimax columbianus</i>	*		*	
* 5.	“ <i>californicus</i>		*	*	*
6.	“ <i>niger</i>	*	*	*	*
7.	“ (“ ?) <i>hemphilli</i>		*		
8.	“ (“ ?) <i>andersoni</i>		*		
9.	<i>Prophysion andersoni</i>		*	*	
10.	“ (“) <i>hemphilli</i>	*			

B. VITRINO D.

* 11.	<i>Mesomphix vancouverensis</i>	*	*	*	*
12.	“ (“ ?) <i>sportella</i>	*	*	*	*
13.	“ (“ ?) <i>simplicilabris</i>		*	*	
14.	“ <i>voyana</i>	*	*		*
15.	“ <i>duranti celata</i>		*	*	*
† 16.	<i>Hyalina cellaria</i>		*		
* 17.	“ <i>arborea</i> (Breweri).....	*	*	*	
* 18.	“ <i>minuscula</i>		*	*	*
* 19.	“ <i>miliun</i>		*	*	*
19. a	“ <i>limatula</i> ?.....		*		*
* 20.	<i>Microphysa pygmaea</i>	*	*	*	
* 21.	“ <i>conspccta</i>		*	*	*
22.	<i>Helicodiscus lineatus</i> ?.....		*	*	*
23.	“ ? (undescribed).....	*	*		

C. HELICOID.

* 24.	<i>Triodopsis loricata</i>	*	*	*	*
* 25.	<i>Mesodon</i> (<i>Aplodon</i>) <i>armigerus</i> ..	*	*	*	*
26.	<i>Arionta arrosa</i>	*	*	*	*
27.	“ “ <i>arbutorum</i>	*			
28.	“ “ <i>holderiana</i>		*		
29.	“ “ <i>stiversiana</i>	*			
30.	“ <i>californiensis</i>	*	*	*	*
31.	“ “ <i>nemorivaga</i>		*	*	*
32.	“ “ <i>ramentosa</i>		*	*	*
33.	“ “ <i>bridgesii</i>		*	*	*
34.	“ “ <i>vineta</i>		*		*
35.	“ “ <i>exarata</i>	?	*	*	*
36.	<i>Campylæa</i> ? (<i>fidelis</i>) <i>infumata</i>	*	*		
37.	“ “ (<i>traskii</i> ?) <i>diabloensis</i>	*	*		*
38.	“ <i>dupetithouarsi</i>				*
39.	“ (“) <i>sequoicola</i>				*

D. PUPOID.

* 40.	<i>Pupilla rowelli</i>		*	*	*
41.	“ “ <i>californica</i>			*	*

E. SUCCINOID.

* 42.	<i>Succinea oregonensis</i>	*	*	*	*
* 43.	“ <i>rusticana</i>	*	*	*	*
* 44.	“ <i>sillimani</i>		*		*
* 45.	“ <i>nuttalliana</i>	*	*		*

* Sierra Nevada, also. † Introduced.

Contra Costa and Alameda Counties.

These two counties form a quadrangle, including the whole region "East of San Francisco Bay," and are about 40 miles square. About 270 square miles of the eastern portion, rising from the level marshes up to about 200 feet, is very arid in summer, the water-courses nearly all drying up, and no trees growing along their banks for 10 or 15 miles. The river shores south of the westward bend, are, however, lined by large trees and shrubbery, where not too marshy, and would no doubt support many species washed down to them, if the floods, both of summer and winter, did not destroy those that escape tramping cattle.

Only two species have been found living near the marshes, Nos. 25 and 32, besides the four amphibious Succineas, 42, 43, 44 and 45.

At the foothills near Mt. Diablo, water begins to be permanent in pools, and above the porous sandstones is found running in summer down to about 100 feet above tides, wherever the harder metamorphic rocks occur, while trees again become common along the streams, and in cool, springy situations live-oaks, pines and shrubbery cover parts of the hillsides. On the north slopes, and always near fossiliferous rocks between 100 and 1,000 feet elevation, are found small colonies of No. 32. From a similar locality on the east slope, Prof. Brewer brought the type of No. 37. I searched carefully on the south and west slopes, but could find none of any kind in the best localities, nor was Dr. Yates more successful in a careful examination of the ridge 10 or 12 miles S. E. of the peak. None were found above 1,000 feet for 5 miles up the north slope, where little lime and no fossils occur, and though these are found over 2,000 feet on the south side, the greater heat apparently prevents the existence of any except Limacoid species.

But as some of these are found active in wet places through the dry season, and dead shells always show the existence of other kinds when not active, it seems unlikely

that we could miss any where they occurred. Some large permanent springs also produced several fresh-water species in plenty.

The trees on this mountain are usually too scattered to give much shelter, and even where most dense, no pulmonates were found, the rock being metamorphic.

As shown on the map, there are here two spurs of the Mt. Diablo range, separated by Livermore Valley and Walnut Creek, but farther south they join, forming the Mt. Hamilton range, in which the whole country is more elevated, many peaks being higher than Mt. Diablo, and the lofty region near the southern boundary of Alameda County is over 20 miles wide, sloping northwest.

A large extent of this table land is covered with snow for many weeks in winter, and large streams run from it all the year into Livermore Valley. The highest parts are more or less wooded with Cedars (*Libocedrus*), Cypresses (*Cupressus*), Pines and Oaks, sometimes quite densely, but being as far as known metamorphic, no land mollusca have been found high up. The northwest summer winds seem to condense the fogs from the sea upon these high regions, while they cool the air without so much desiccation as on the lower ridges and valleys. But unlike the Sierra Nevada, this range does not seem to produce land pulmonates above 1,000 feet, and as on Mount Diablo they only occur near fossils. Dr. Yates explored much of the region, and not having been there myself, I quote from his letters: "I only found land shells where the miocene or cretaceous fossiliferous sandstones cropped out, between 800 and 1,100 feet elevation, six miles N. W. of the summit of Cedar Mountain. These rocks in the deep ravines along the west side of the ridge near its base, contain many fossils; higher up, it is all metamorphic and no land shells were found." The species he found were 7, 15, 30, 34, 37.

Thus the general fact is confirmed that No. 37 is one of the group living in or near coniferous forests where the soil

is calcareous. It has not been found west of this locality, but reappears southward at Salinas River, and there borders on the range of its nearest allies, Nos. 38 and 39, which, as before stated, may be off-shoots from it in the cool coast ranges. That it does not run into the *Arionta* group westward, is shown by the forms of that sub-genus found with it, being the two most unlike it known to exist.

The most unexpected fact was finding No. 34 exactly like the Monterey variety, which is elsewhere known only near the coast, and rare.

Livermore Valley, which is about 80 square miles in area, is too dry in summer for any species to live, except in very rare spots along the banks of creeks where they may survive under logs, roots or stones, but we found none except on the borders of a marshy lagoon, and the streams entering it from the north or west, near where Alameda Creek cuts through the western spur of the mountains. Those found were Nos. 1, 7, 14, 31, 32, 33, 42, 43, 45 (Nos. 14 and 31 at the base of the hills only). It is probable that the alkalinity of much of the water in summer prevents the existence of both land and fresh-water pulmonates in other parts of the valley.

It is well known that while springs containing little mineral matter except lime, are favorable to them, those having much of other salts are injurious, which explains their absence from many regions where metamorphic or volcanic rocks prevail, as well as from unaltered regions where salts have remained from marine deposits, or percolated through from other rocks.

The northern border of Contra Costa County would appear more favorable to them than we have found it to be, but the summer wind blows through the gap with such force as to desiccate the shores too much for the growth of many trees, and west of the river junction the marshes are too salt to suit them, so that there is very little shelter in the dry season. Those known from there are Nos. 5, 11, 24, 25,

32, 36, 42, 43, four of which were found also on the eastern border.

The western slope of the mountains forming the eastern shore of the bay (called Contra Costa hills), is mostly of metamorphic rocks near its base, but partly covered with pliocene gravels up to 300 feet, while miocene sandstone with many fossils forms the summits and eastern slopes of the spur. The creeks draining it all head within this fossiliferous region, and carry down lime in abundance to the valley soils. There are also calcareous springs depositing tufa along the junction of the pliocene and metamorphic rocks in many places. It receives the full effect of the summer fogs condensing about the summits, as well as more winter rain than eastward, while the sea breezes keep it cool in summer. We therefore find it the most favorable region yet mentioned for land pulmonates, which, however, still seem absent everywhere above 1,000 feet elevation.

The influence of these new conditions is seen here also in the commencement of a new group of botanical species, accompanied to some extent by animals also, of species not known east or southward in the Mt. Diablo range, but characterizing the coast ranges west and north of San Francisco Bay. The most conspicuous example of this is the isolated grove on Redwood Peak; but some of the shrubs and smaller plants have a wider range.

Although Rocky Mound, five miles north, is much higher, its upper parts are entirely metamorphic, and thus unsuited for the redwood. The Peak has its eastern slope and summit composed of sandstone lying upon serpentine, and at the junction numerous springs come out forming creeks running in every direction.

The redwood trees grew in 1850 pretty thickly over a surface about two miles square at the summit, mostly in clumps around the springs, and becoming scarcer down to about 500 feet elevation. Though many hills in the ridge are as high or higher, this was the only one so wooded, being the

only one having the necessary conditions for their growth. The nearest groves of the species are 21 miles N. W. and 23 miles S. W., across the bay, but some buried logs in San Francisco County, about 14 miles distant, show that a few grew there during past centuries. A few grew along San Leandro creek, to a distance of six miles south, and were as large as the others.

Several sawmills were built soon after 1849, and every accessible tree large enough for use was cut down. The roots being almost indestructible, however, have sprouted vigorously, sending up 10 to 20 sprouts about each stump, and these now shade the ground around springs more densely than the large ones, though probably not condensing so much moisture from fogs. They are now a foot thick, fifty feet or more high, and sometimes covered with cones, showing no tendency to die out. The stumps are mostly about 12 feet thick, and the old trees probably averaged 200 feet high. Unfortunately, this magnificent tree grows so much slower than some others that it is not a favorite, and the settlers grub or burn out all those on land suited for cultivation, besides destroying thousands every year for decorative uses.

I have described this grove particularly because its moist, cool locality seems exactly suited for land pulmonates, and yet none are found above 1,000 feet on the peak, and only two species there, Nos. 5 and 11, one a *Limacoid*, the other very thin-shelled, but not found in the drier regions eastward.

The reason indicated by these two species for absence of others seems to be the want of lime, and to confirm this we find at about the lower limit of redwoods on San Leandro Creek, other species of the coast range, Nos. 25, 26 and 31, (26 very small, but typical), appearing where branches from the east bring down lime from the more eastern ridges.

The sandstone of the peak is supposed to be cretaceous, but contains no fossils, while the miocene strata three miles

eastward contain many, but are so much drier that land pulmonates are rare on them, and are the same species found west of Livermore Valley.

There is a dense growth of trees on many of the north and east slopes of these hills, especially where springy, which form shelter for such animals, but only one small grove of pines grows two miles northeast of the peak on a very dry sandstone ridge, and can have no effect on the land shells, being a species of the arid eastern slope of the range. Toward the northwest, however, appears another of the coast range species, No. 36, between 250 and 400 feet elevation, along the belt of calcareous tufa before mentioned, which runs about four miles N. W. through Piedmont Valley, and the same distance S. E.

It is accompanied by the largest number of species found east of the bay. They are Nos. 1, 5, 9, 11, 12, 15, 17, 23, 28, 31, 36, while in scattered localities lower down are found Nos. 6, 24, 25 42, 43, and near the bay shore Nos. 2 and 3 (introduced), 20 and 21 in gardens, 40, and Nos. 18, 19 and 22 have been reported from the vicinity. Fires, clearing, and cultivation of the land, have no doubt much thinned out most of these, as few of them are found abundantly.

As none exist on the higher and steeper parts of the hills, the settlement of the lower more cultivable parts must tend to cause a still greater scarcity of many of them, especially those limited to this vicinity, Nos. 28 and 33. The tendency of migration is chiefly downward, shells being carried by the winter freshets down the streams, but the more general cultivation of the level lands tends to exterminate them, with some exceptions hereafter noted. There formerly existed large colonies of some species in willow thickets and meadows near the bay, but few are now found in such places. I was told by an old resident that he once found a large colony near Redwood Peak, in a meadow near a mill, and as I have not found any at the sawmills

which were near 1,000 feet elevation, I suppose he meant a flour-mill then standing $5\frac{1}{2}$ miles N. E. of the peak at about 400 feet altitude, near the original locality of No. 33, and where also occur other forms of No. 30. I found a great colony of No. 35 near the head of the bay in 1855, and some were still found there by H. P. Carlton in 1870.

I have heard from gardeners at various places around the bay, of great numbers being washed down in very wet winters, but they often confound the damage done by *Lima-coids* with that of the less common shelled kinds. The banded *Helicoids*, Nos. 26 to 35, seem quite able to increase in gardens and meadows, where they run into still more varieties, and have probably supplied the forms figured by authors, which have been hard to identify. From the frequency of the *Ariontas* in gardens, they are beginning to be known near this bay as "Garden Snails," and foreigners have even attempted to cultivate the larger kinds for food. The shell mounds left by the Indians are also favorite localities on account of the lime; but I have never found any buried in the mounds as proof that the Indians ate them.

The drainage basin next south of Redwood Peak, is on the branches of San Lorenzo Creek, of which the town of Haywards is near the centre, including about 270 square miles, and reaching east 15 miles. It is much drier and warmer, so that most species become more rare, and Nos. 25, 26 and 28 disappear. From ten years residence, however, I have been able to find most of the others found northward, though some are exceedingly rare. No. 2 has not been introduced, nor Nos. 18, 19, 22, found, being rather doubtful as east-side species

On the other hand we find the new forms, Nos. 7, 8 and 13, which may all prove to be varieties of allied species caused by the increased dryness, as they are of doubtful occurrence elsewhere. Much less trees and shrubs grow on the hills, chiefly in cañons and on north slopes, while fossils are limited to the eastern half of the hills. A few species

are found up to 1,000 feet elevation rarely. No. 36 is not found south of Alameda Creek, and No. 32 becomes the prevailing form of 30, as it was in the dry region near Mt. Diablo.

The species of the upper part of Alameda Creek basin having been mentioned, there only remain about 200 square miles of Alameda County around Mission Peak. The only species known from there are Nos. 24 and 32; but close search will probably reveal other smaller species. There is, however, an evidently rapid decrease, caused chiefly by dryness. Dr. Yates thinks that No. 32 goes higher up this peak than elsewhere, fossils being also found nearly to its summit, where a less arid climate must prevail.

From here southeast the Mt. Hamilton range has been mentioned as not known to produce any species on the higher portions. But some of the lower ranges on its west slope are fossiliferous, and may be supposed to have some species, especially Nos. 5, 8, 9, 14, 32, 37, the best suited for dry regions, and in wet places, Nos. 42 to 45. Though part of the same mountain range described last, it belongs to the next county to be mentioned.

On the map the number 686 is the height in feet of Livermore Pass (a little west of the figures), 485 is the elevation of the town of Livermore, 264 of Suñol, at the head of Alameda cañon, the lagoon referred to being a few feet higher and some five miles northward. The lettering often obscures the lines of elevation, so that they cannot always be counted for heights.

The next article will describe the distribution in the remaining counties, and give the geological deductions derived therefrom, showing why it differs so much from that of the Sierra Nevada.

Corrections of Article "On Fossil and Sub-Fossil Land Shells in the United States," in Bull. 4.

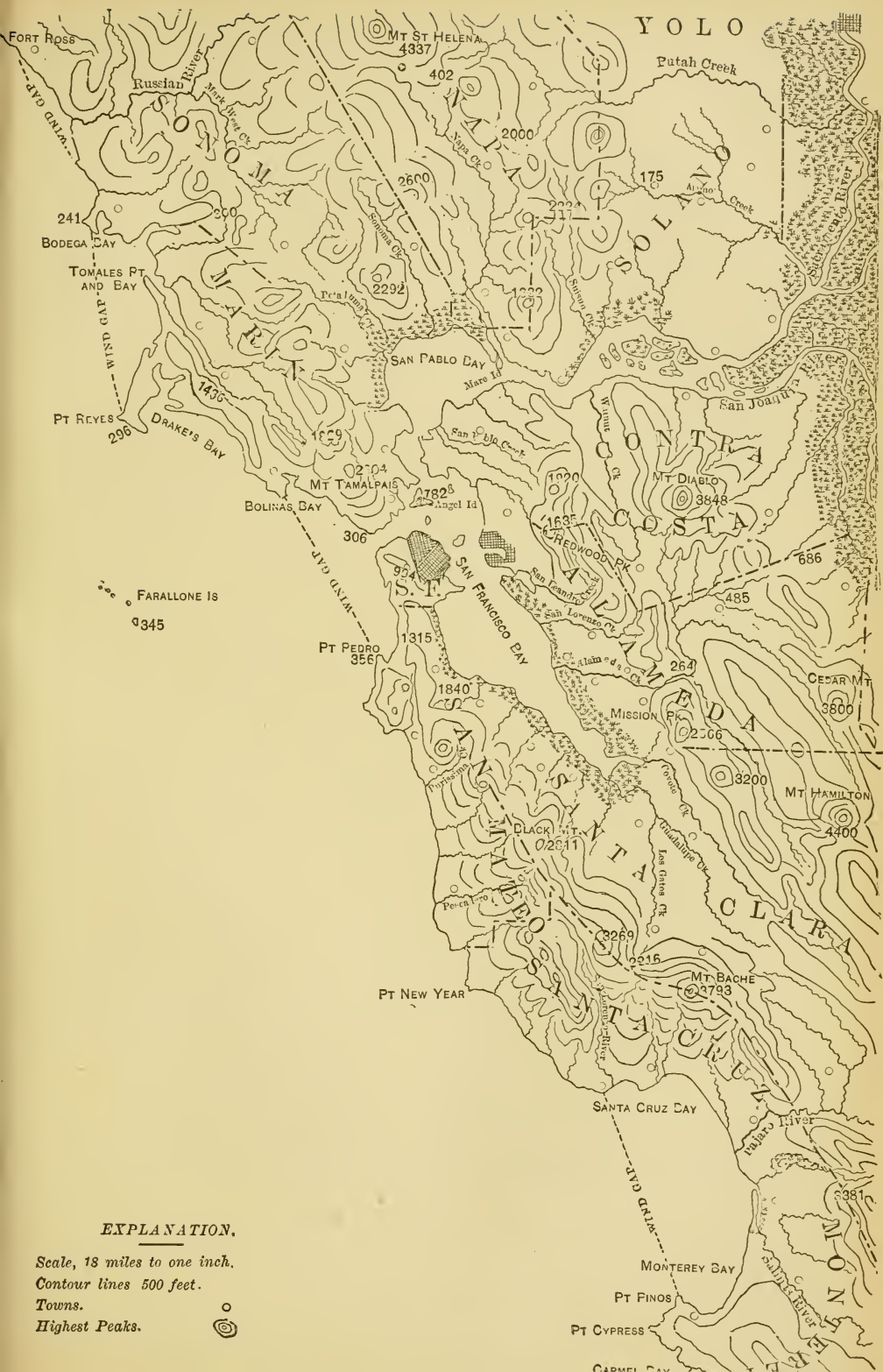
Page 236—From the full list of Bland's works, published lately by Mr. A. F. Gray, C. E. (Salem, Mass., 1884), it appears that most of his papers on West Indian shells, and those quoted in Binney's Bibliography, are dated before 1858, but those on North American species, between 1858 and 1883.

Page 246—Later information from Mr. Thomson, and also from Mr. Moores (p. 248), will be given hereafter under the head of introduced species.

Page 247—"Macrocyclis." The type of this genus being now known to belong to a different family, I have in the table, page 367 of this article, substituted *Mesomphix*, of Rafinesque, of which the type was "*M. planorboides*," so admitted by Ferussac and Pfeiffer in many publications. The fact that the species was previously named *concava* by Say does not invalidate the generic name, nor does its use as a sub-genus of *Zonites* by W. G. Binney, affect its previously established position. Mr. Ancey has made for the same genus the name *Selenites*, a word already used in mineralogy, and not at all needed here. The genus as named by Rafinesque is as well established as his *Mesodon*, now generally adopted on quite as slender foundations.

Page 252—The lowest paragraph was accidentally misplaced, as it should have preceded *Limax*, etc. Very full information on species near lat. 49°, mostly furnished by Rev. G. W. Taylor, will appear later.

Page 255—Mr. Binney's exact words are, "It has simple genitalia without the accessory organs usually found in *Arionta*." He has, however, since described the plainer Eastern forms from Montana, etc., as "*Mesodon ptychophora*," with varieties *major* and *minor*.



STUDIES IN THE BOTANY OF CALIFORNIA AND PARTS
ADJACENT.

BY EDWARD LEE GREENE.

VI.

1. *Notes on the Botany of Santa Cruz Island.*

Santa Cruz is one of the principal units in a succession of eight islands which lie along the Coast of California south of Point Conception. All but two or three of the smaller members of the group are near enough to the mainland to be plainly visible on a clear day; and the arrival at any one of them, except the two or three most remote, is only a matter of an afternoon's sail from one or another of the mainland seaport towns of that part of the State. To people who know something of the special interest which attaches to insular natural history in general, it may seem strange that, while the mainland botany of California has been, during the last thirty years, assiduously cultivated by many collectors, amateurs and professional botanists, these large islands, so near at hand, have been left until recently quite unexplored. Removed as they are to hardly more than a song bird's flight from the California Coast Range of mountains, it may have been inferred that their vegetation would be altogether that of the mainland; and that the scientific exploration of no one of them would be likely to repay the possible discomforts of a day's sail across the channel and a week's encampment on ground so rugged, and withal so barren looking as all these island steeps appear when viewed from a distance of twenty or thirty miles.

But the few fragments of positive botanical information which did, years ago, come in from one and another of the group, were sufficient to indicate the probability of many interesting peculiarities in their flora. Some forty-four years ago Mr. William Gambel of Philadelphia, an ornithol-

ogist, visited Santa Catalina, the nearest and most readily accessible of these islands. This gentleman, although not a botanist, had the botanical good sense to prepare and take away a few plant specimens; and his small collection was found to contain not only species not known on the mainland, but also some new generic types. One of these, *Crossosoma*, is so peculiar as almost to represent a distinct natural order, and is more related to the *Dilleniaceæ* of Asia and Australia than to any plants of the American continent, except its single congener, more recently discovered, which inhabits the desert region of southeastern California.

Mr. Gambel's trip to Santa Catalina appears to have been the first, and for thirty years and more it remained the only visit which had been made to any of these islands, by any naturalist who had an eye to botany. But in the month of September, 1884, Mr. William S. Lyon of Los Angeles spent three days botanizing on this island, and in June and July of the year following continued his valuable researches during three weeks. Moreover, in April, 1885, he spent four days on San Clemente, in company with another botanist, Rev. J. C. Nevin. The highly interesting results of these several expeditions were published in the *Botanical Gazette* for 1886. Mr. Lyon's lists number, for Santa Catalina, one hundred and fifty-one species; for San Clemente, eighty-one. Out of these about fifteen were new to science, and at least ten others were unknown except from other islands, including the distant and isolated Guadalupe, making, out of a total of two hundred and thirty-two species, at least twenty-five which are not found on the mainland. One of Mr. Lyon's novelties, appropriately named *Lyonothamnus*, was of a new generic type; so that the islands of this group could now boast of at least two peculiar genera of flowering plants.

The fruits of these explorations of Santa Catalina and San Clemente were thus of a nature to intensify our desire of becoming acquainted with the vegetation of Santa Cruz, and

other large islands which lie to the northward and also somewhat to the seaward of those above named. But in the meantime we had not remained in quite total ignorance of the botany of Santa Cruz; for in the year 1874 the late Dr. Albert Kellogg and Mr. W. G. W. Harford were there for some days, in connection with the United States Geodetic Survey of the islands; but it was too late in the season for much botanizing. They were also on the large adjacent island of Santa Rosa at about the same time. I could never find that they brought specimens of more than six species of plants from the two islands; but all were new. Three of them, namely, *Leptosyne gigantea*, from Santa Cruz, and *Dendromecon Harfordii*, and *Grindelia latifolia*, from Santa Rosa, were published by the late Dr. Kellogg shortly afterwards in the Proceedings of the California Academy. The other three, *Saxifraga malvaefolia*, *Eriogonum arborescens* and *Hazardia detonsa*, all from Santa Cruz, were published more recently by myself. In 1885 the beautiful new tree, *Lyonothamnus asplenifolius*, a second and very striking species of Mr. Lyon's new genus of Santa Catalina, having been brought to our knowledge by Mr. Hazard of Santa Barbara, as one of the peculiar products of Santa Cruz, determined the present writer to pass, if possible, a part of his next vacation on that particular island. The list of species known as certainly belonging to it numbered now, indeed, only four¹, and all four were apparently endemic; at least not one of them was known to occur on the mainland, or even upon other islands of the group. My opportunity for carrying into effect the purpose I had formed came in July of 1886; and by the kindness of Mr. Justinian Caire of San Francisco, who is the owner of the island, my inspiring task was begun under very favorable auspices, except that I was quite too late in the field for the best botanizing, it being near the middle of the dry season of the year, when

¹The habitat of *Corethrogyne* (now *Hazardia*), *detonsa*, which really made the fifth, was not yet known.

but an imperfect knowledge could be gained of that abundant annual vernally maturing vegetation which, in all parts of California lying near the level of the sea, is the glory of the floral year.

Before passing to remark upon the flora more particularly, it will not be amiss to speak briefly of the physical aspects of the island in general.

As seen from the city of Santa Barbara, at a distance of about twenty-five miles, the island of Santa Cruz appears to rise, like a blue precipitous mountain range, from the bosom of the sea. It is about twenty-three miles long, and, in different places, from three to seven miles broad, the highest peaks rising to an altitude of somewhat less than three thousand feet. The near approach reveals a succession of more or less sharply outlined hills rising one behind another. This lengthwise range of mountains, which forms all that is seen of the island as it is approached from the northern or Santa Barbara side, is intersected at short intervals by deep and narrow gorges which run down to the sea. In most of these running water of good quality is to be found at almost any time in the year, so that the northern slope may be said to be well watered; and the common trees of the nearest mainland mountain districts, such as the large-leaved maple (*Acer macrophyllum*), live oak (*Quercus agrifolia*), poplar (*Populus trichocarpa*), willow (*Salix levigata*), and many more are found thriving in all these cañons; and yet the tree which is commonest of all in similar situations on the mainland, the sycamore (*Platanus racemosa*), is entirely absent from Santa Cruz. The mouths of the cañons afford the only landing places along all the coast line. The gravelly beds of the streamlets which run down them, are the only parts of the island's surface which descend at all gradually to the ocean's edge. At these points, and not elsewhere, will the boatman or sailor find a narrow strip of beach, and that barely com-

mensurate with the breadth of the gorge itself. With the exception of these, the whole coast of the island rises almost or quite perpendicularly from the water, the first terrace of comparatively horizontal ground setting in at the height of from twenty-five to five hundred feet above the tide. This lowest succession of slopes forms a considerable part of the best grazing land of Santa Cruz. It is an open, rolling district, extending back for a half mile or more, everywhere intersected by the narrow cañons mentioned, covered with fine grass, dotted with clumps of scrub oak (*Quercus dumosa*), and some patches of manzanita (*Arctostaphylos*), with here and there a grove of the beautiful fern-leaved *Lyonothamnus*. Back of this terrace the land rises more abruptly, breaking into rocky shelves and deep gorges, and the vegetation becomes more arboreal. Here are dense forests of a small pine, identical with that which is found on Cedros and Guadalupe, and which is not heretofore reported from other islands of the Santa Barbara group; clumps of a large-fruited evergreen cherry-tree allied to, but distinct from *Prunus ilicifolia* of the continental Coast Range; impenetrable thickets of manzanita, with here and there a group of oaks, *Q. agrifolia* and *Q. chrysolepis*.

From the summit of this northern acclivity one looks down, not, as one might expect, to the southern shore of the island, but into a deep and fertile valley of considerable extent. Up and down this stretch of valley are fields and vineyards, and, in the midst of all, an assemblage of cottages and barns, the principal one of the four or five ranches which have been established by the owner of the island, and are occupied by superintendents and laborers. This valley, forming, as it does, a great depression in the middle of the island, will, if the island be of volcanic origin, pass for the extinct crater which it looks as if it might be. Down the western half of the depression courses a stream which is flowing, at intervals, at least, during even the dry season of the year, and which finds its outlet into Prisoners' Harbor

by a broad and beautiful cañon between two and three miles long. The valley enjoys immunity from the fogs which for a considerable part of the year shroud the seaward slopes, and has, along with its peculiar climate, a quite characteristic vegetation, as will be indicated in the catalogue of species which is to follow.

To the number of four species which were previously known to inhabit Santa Cruz, my pleasant but laborious weeks of sojourning there have added upwards of three hundred. The list here given numbers, indeed, three hundred and twenty-one. About twenty-five of these are plants indigenous to the Old World, but naturalized in California. Deducting these five and twenty plants of alien derivation, there remains a list of two hundred and ninety-six indigenous species. Out of this number the very surprisingly large proportion of forty-eight are unknown, except from this or other islands off this coast, and as many as twenty-eight of the forty-eight are, in so far as our present knowledge of the other islands goes, peculiar to Santa Cruz itself. Excluding, then, the four endemic species which had been discovered before my advent to the island, there stand forth, as the result of my own researches, twenty-four entirely new to science. A considerable proportion of these novelties have been described already in some earlier pages of the present volume of *Bulletins*. Some others were printed in *Pittonia*, and descriptions of the rest are to be sought in the catalogue which supplements this paper. It must not be presumed that this list is anything like a complete one. My explorations were limited to the western half of the island, and my time was quite too short for a thorough study of even that part of the whole ground before me. The eastern half remains untouched. What was done was done, as I have indicated, at quite too late a season of the year. Several of the new annuals I could not have characterized, as I found them dead and bereft of everything save their

capsules, and I have diagnosed them from plants raised from seed which I brought home. Perhaps the list does not enumerate more than two-thirds of the actual species which exist on Santa Cruz. But it numbers more than twice as many plants as have been reported from any other one member of the group. Peculiar circumstances of the distribution of the species, together with the astonishing number of such as are endemic, will make the list appear more like that of some remote and strictly oceanic island than of one lying close beside a great continent. I do not think that continental islands in other parts of the world offer any parallel to what Santa Cruz exhibits in this respect. That a small ridge of mountain rising out of the sea at only twenty-five miles' distance from a mainland shore should present forty-eight species of phanerogamic plants not to be found on the continent itself is, to my understanding of the case, a fact entirely unique in the annals of phytogeography, and I cannot but wonder if competent geological authority will not, after careful investigation, assure us that this group of islands has a very peculiar geological origin and history. There seem to be indications that, as a group, they have contributed to the flora of the continent as freely as they have received contributions from it. I know not how else to interpret the fact that while those types which are peculiarly and distinctively Californian are strongly predominant on the islands, those which, being found in California, are also common to all North America are but very feebly represented. *Delphinium* and *Ranunculus*, *Ribes*, *Rubus* and *Lonicera*, for example, abound on the Pacific Coast of the continent, but are equally prevalent all the way across it; and the representatives of those genera, and others in the same category, are among the very rarest plants of Santa Cruz, seeming as if their arrival there had been a late one—too late for them to have secured an ascendancy. On the other hand, the distinctively Californian genera, like *Dendromecon* and *Eschscholtzia*, *Thysanocar-*

pus and *Zauschneria*, abound in such numbers, both of species and individuals, as to force on us the strange question of whether it was not from these, as from seed-beds, that our mainland plants of the same genera were derived. There is one species of *Dendromecon* dispersed widely up and down the Californian mountain districts, and this, until lately, was supposed to be a monotypical Pacific North American genus. The hills of Santa Cruz are embellished everywhere with a second strongly marked species much larger than the mainland one; while Santa Rosa, closely adjacent, furnishes the third. It is also to be noted that Mr. Lyon reports the original species as occurring on Santa Catalina, the island nearest the continent; so that the archipelago has all three species of this genus, the mainland one only. In *Eschscholtzia* closely allied to *Dendromecon*, we find two species, and these exclusively insular, on Santa Cruz. In the order of *Cruciferae* the most characteristically Californian genus is *Thysanocarpus*, and its nearest relative is the Asian *Tauscheria*. Santa Cruz has two *Thysanocarpi*, both most distinct from all species hitherto known, having their own well marked habit, but, in fruit character, betraying the closest affinity for their Old World ally.

The *Cistaceae* are prevailingly an Old World order of plants. There is but one representative of it on the western coast of the North American continent. On Santa Cruz this species abounds as nowhere else, and is there associated with a second and new member of the same genus, *Helianthemum*.

In the vast order of the *Leguminosae*, as in *Ranunculaceae*, there is exhibited a dearth both of species and individuals of those genera which belong to the whole of North America, and a superabundance of them in such as are distinctively Californian. One rarely meets with a *Lathyrus*, a *Vicia* or an *Astragalus*, and the few and scattered individuals in such genera occur only by the shores and in places

where we know their seeds could have been driven across the channel during a winter's storm. The clovers also are few, and there is but one peculiar species. But the whole island is abundantly stocked with species of *Hosackia* and *Syrmatium*, which genera are exclusively West American, and about half the species are peculiarly insular. Passing to the *Rosaceæ*, we find the island totally destitute of such cosmopolitan genera as *Spiræa*, *Fragaria*, *Potentilla* and *Geum*, of which there is no great dearth on the other side of the channel; but the Californian genus *Heteromeles* is about twenty fold more abundant on this island than on any equal extent of mainland territory; and *Adenostoma* and *Cercocarpus*, also Pacific American exclusively, are very plentiful. Mr. Lyon in his very valuable paper,¹ has spoken particularly of the fine wild cherry (*Prunus occidentalis*) of Santa Catalina, which he fancies may be peculiar to that island. It prevails quite as universally and is equally luxuriant on Santa Cruz. If there exists between this and its depauperate congener of the Californian Coast Range, the relation of parent and offspring, it must be that the insular is the parent species. One of the principal morphological differences between the two is this: the leaves of *P. occidentalis* are ample and nearly or quite entire; those of *P. ilicifolia* are, as the name implies, coarsely spinose-toothed, and they are smaller. But the peculiar foliage of the reduced mainland species is precisely that of all young seedlings of the insular, showing the case of the former to be one of arrested development. The smaller size and the less palatable and smaller fruit of *P. ilicifolia*, are facts which combine well with its habit of retaining the foliage of the insular seedling, to argue that the tree in migrating to our side of the channel found in our mountains a soil and climate less adapted to its full development. In confirmation of this

¹ Botanical Gazette, xi. 197.

view I should say, that in the *Cerastes* section of *Ceanothus* where the prevailing species have entire leaves, and those less common have them spinose-toothed, young seedlings of the entire-leaved kinds always exhibit the spiny-toothed foliage which, as it would seem, has become permanent in the less common and more depauperate kinds.

Before passing from the subject of the concentration of Californian types on Santa Cruz, I will mention one or two further instances of it: that of *Zauschneria*, the original species of which is found here and there along the northward slope only, while the valleys and cañons of the interior and at the south side are, in many places, a very garden in the abundance of two large new ones; and lastly, *Bloomeria*, which, although frequent along our southward mainland districts, is far from ever growing in showy masses. It is common on all parts of Santa Cruz; but on grassy knolls in the middle of the island it thrives in such abundance that the umbels touch each other over almost acres together.

Turning now to a different phase of the subject, it is very evident that a goodly number of less common or even rare plants of our southern counties have, within a comparatively recent period, been given to us from Santa Cruz itself. *Comarostaphylis diversifolia*, a rare shrub of the San Diego region, is now found to be one of the common small trees of our island. This is its native land, and the scattered and ill-grown individuals of the coast below indicate that out of the island's abundance some of the light woody nutlets drifted thither and germinated. In the spring of 1885, I found a small and slender but well grown *Bæria*, which was new to me, common along the shores of San Diego Bay, not described in any of our books, and which I had intended to publish sooner or later. It is now found to be precisely the peculiar *Bæria* which abounds on Santa Cruz, and which Mr. Lyon has also brought from San Clemente. Still more remarkable is the case of *Malacothrix incana*, discovered at San Diego by Nuttall, more than fifty

years ago, never since seen or heard of until the past season, when I found it plentiful on the remote islet of San Miguel, and also at the western extremity of Santa Cruz. It is more than possible that Nuttall's scant specimens from San Diego were made from a single plant, and that perhaps this only one which ever became exiled there. It would naturally be in this great family of the *Compositae* whose seeds are made to travel with the winds, that we should expect to find plants of insular origin most frequently establishing themselves upon the continental shores, and in the interior beyond the coasts; and more especially, since the dry season, during which the seeds of these plants are matured and given to the air, is the time when the trade winds prevail from the islands toward the continent.

The only thistle on Santa Cruz was evidently a new species. Nothing like it was known to me; but not long after my return, Mr. Parish of San Bernardino, whose district is exactly to the leeward of this island, sent me this same thistle for a new species of his own vicinity. Still another somewhat rare *Composita* of the San Bernardino region, *Stephanomeria cichoriacea*, a species very remarkably differentiated from its numerous congeners, is superlatively plentiful on our island, and that not on the northern slope nearest the mainland, but in the interior and on the southern or seaward slope. With its white-woolly herbage, and tall stems growing in prodigious clumps in every rocky place or hanging from the niches of the highest and most inaccessible precipices, it is one of the striking figures in the Santa Cruz landscape, and doubtless the island is the birthplace of this species.

Thus far our insular botany has yielded two generic types which have no continental species. One of these is *Lyonothamnus*. This is represented by one species peculiar to Santa Catalina, and by a second which in so far as we know is endemic on Santa Cruz, where it is the most beautiful, as it is one of the most abundant arboreal products. The

other genus is *Hazardia*—shrubs of the order of *Compositæ* in some respects intermediate between the Australian shrubby asters and the Californian genus *Corethrogyne*. Two of the species of *Hazardia* belong to Santa Cruz exclusively, and the third is of that remote and isolated island not belonging to this group, Guadalupe.

The most interesting of all our insular plants to me are the *Lavateras*, of which I could, however, find no trace on Santa Cruz. But they ought to be named in this connection, furnishing as they surely do, one of the most suggesting hints that our little archipelago may actually have been connected with some other continent than ours. Of *Lavatera* there are some eighteen or twenty species in various parts of the Old World, and there is one in Australia. On our American continent we have not one; but the little islands which lie off our southern coasts have already yielded four indigenous and quite peculiar species of this genus. One of these four inhabits Guadalupe: the second, San Benito, a cluster of rocky islets not far off the Lower California peninsula, and nearly east of Guadalupe: the third is peculiar to the Coronados Islands, which lie in sight of San Diego: the fourth has been found on two or three members of the Santa Barbara archipelago. This is, I repeat, the most marvelous fact which I am acquainted with in connection with Pacific North American botany; and it is one which strongly pleads for further exploration and study of these inviting insular fields.

2. *A Catalogue of the Flowering Plants and Ferns of the Island of Santa Cruz.*

1. CLEMATIS LIGUSTICIFOLIA, Nutt.; Torr. & Gray, Fl. i. 9. Growing luxuriantly in cañons on the south side.
2. RANUNCULUS DEPPEI, Nutt.; Torr. & Gray, Fl. i. 21: *R.*

Californicus, Benth.¹ Pl. Hartw. 295; Brewer & Watson, Bot. Cal. i. 1; Gray, Proc. Am. Acad. xxi. 374, excl. var. *latilobus*. North side, near the sea; apparently scarce.

3. DELPHINIUM ———? A single plant, in fruit only, high up in a cañon of the north side.

4. PLATYSTEMON CALIFORNICUS. Benth. Trans. Hort. Soc. 2. i. 405.

5. PLATYSTIGMA DENTICULATUM, Greene, Bull. Torr. Club. xiii. 218.

6. MECONOPSIS HETEROPHYLLA, Benth. l. c.

7. DENDROMECON FLEXILE, Greene, l. c. 216.—On bushy hillsides everywhere; quite plentiful on the northward slope at no great distance from the shore.

8. ESCHSCHOLTZIA GLAUCA, Greene, Pittonia, i. 45.—Confined to the interior of the island, and the southward slope.

9. ESCHSCHOLTZIA RAMOSA, Greene, Bull. Torr. Club. xiii. 217.—On a small rocky islet near the northern shore; a strictly maritime plant, growing only within reach of the sea spray; also found on the sea shore on Guadalupe.

10. CARDAMINE INTEGRIFOLIA.² = *Dentaria integrifolia*, Nutt.; Torr. & Gray, l. c. 88 (1838); *Cardamine paucisecta*, Benth. Pl. Hartw. (1857).—Northward slope; not common.

¹ This very common field buttercup of California was named by Nuttall, in honor of Ferdinand Deppe, a German botanist who had been his predecessor in field work on this Coast. The name, *R. Deppei*, was printed, along with the essential character of the species, not much less than twenty years before the appearance of Bentham's *R. Californicus*.

² Mr. Nuttall was entirely correct in placing this plant under *Dentaria*, and if the genus be kept up it must remain there. But, as Bentham and Hooker have said, *Dentaria* does not differ from *Cardamine*, either in habit or character.

There is another Californian species which has, until now, remained nominally under the former genus, and may be called CARDAMINE NUTTALLII = *Dentaria tenella*, Pursh, Fl. ii. 439; Torr. & Gray, Fl. i. 87; Brew. & Wats. Bot. Cal. i. 30. The adjective specific name *tenella* has already been used in *Cardamine*.

11. ARABIS FILIFOLIA=*Cardamine filifolia*, Greene, Pittonia, i. 30.—Notwithstanding its close resemblance, in some respects, to our common *Cardamine oligosperma*, this new insular plant must needs be an *Arabis*, for its siliques are not only not elastically dehiscent; they are very tardily dehiscent, and so, when ripe, plainly those of the genus to which the species is now referred.

12. THELYPODIUM LASIOPHYLLUM, Greene, Bull. Torr. Club. xiii. 142.

13. SISYMBRIUM PINNATUM=*Erysimum pinnatum*, Walter, Fl. Carol. 174 (1788): *Sisymbrium canescens*, Nutt. Gen. ii. 68 (1818).

14. SISYMBRIUM OFFICINALE, Scop. Carn. ed. 2, n. 824.—In cultivated lands only.

15. NASTURTIUM AQUATICUM, Tragus, Hist. 82 (1552); Dodonæus, Pempt. 581 (1583); Bauhin, Pinax. 104 (1623); *N. officinale*, R. Br. Hort, Kew. ed. 2, iv. 110 (1812).—Mouth of streamlet at Prisoner's Harbor.

16. BRASSICA NIGRA, Boiss.—Not widely prevalent.

17. CAPSELLA DIVARICATA, Walp. Rep. i. 175.—On a low promontory, near the seashore, on the north side of the island; probably adventive, for only one plant was seen.

18. CAPSELLA BURSA-PASTORIS, Mœnch, Meth. 271.

19. LEPIDIUM NITIDUM, Nutt.; Torr. & Gray. Fl. i. 116.

20. LEPIDIUM MENZIESII, DC. Syst. ii. 539.

21. ATHYSANUS PUSILLUS, Greene, Bull. Cal. Acad. i. 72.—Common on the northward slope.

22. THYSANOCARPUS CONCHULIFERUS, Greene, Bull. Torr. Club, xiii. 218; Pittonia, i. 31.

23. THYSANOCARPUS RAMOSUS. Wholly glabrous and slightly glaucous, a foot high, the stem parted near the

base into many erect, leafy and at length racemose branches; leaves 2—4 inches long, linear, those of the branches entire, or with a few scattered small but salient teeth, and an auriculate-clasping base, the lower and radical with 2—3 pairs of linear divaricate lobes: raceme naked, the pedicels slender and recurved: sepals minute, cymbiform, erect-spreading in flower, white, with a broad green mid-vein: petals twice the length of the sepals, spatulate-oblong, retuse: stamens 6, all of the same length, three on each side of the broad flat pistil: samara regularly and rather strongly concavo-convex, the crenate margin with or without some oblong perforations: style short, persistent. Species just intermediate between its very singular island congener and the mainland *T. crenatus*; having the foliage and branching habit of the former, nearly.

24. *OLIGOMERIS SUBULATA*, Boiss. fide Brew. & Wats. Bot. Cal. i. 53.—Common along the sea shore.

25. *HELIANTHEMUM SCOPARIUM*, Nutt., Torr. & Gray, Fl. i. 152.—Common in the interior: suffrutescent, and strongly so when mature; nevertheless flowering freely the first year from the seed, thus often appearing as-if annual.

26. *HELIANTHEMUM OCCIDENTALE*, Greene (see page 144).

27. *FRANKENIA GRANDIFOLIA*, Cham. & Schlecht. Linnæa, i. 35.—Back of the beach, at the west end, abundant.

28. *SILENE ANTIRRHINA*, Linn. sp. i. 419.

29. *SILENE GALLICA*, Linn. l. c. 417.—Quite as common as on the mainland.

30. *SILENE QUINQUEVULNERA*, Linn. l. c. 416?—Smaller than the preceding, with a larger capsule and calyx more stiffly hirsute, growing with it on hillsides everywhere in the interior of the island. The plant was long past flowering, and may possibly be *S. nocturna*; but whichever species, it is otherwise unknown in this part of the world, and must

have arrived there with seed of grain or other cultivated plants, from southern Europe.

31. *SILENE LACINIATA*, Cav. Ic. vi. 41?—Plant glabrous, the leaves all very narrow: stems numerous, slender, decumbent, from a thick, perpendicular fusiform root. Frequent on northward slopes.

32. *STELLARIA MEDIA*, Smith, Eng. Bot. t. 537.

33. *STELLARIA NITENS*, Nutt.; Torr. & Gray, Fl. i. 185.

34. *SAGINA OCCIDENTALIS*, Watson, Proc. Am. Acad. x. 345.

35. *LEPIGONUM MACROTHECUM*, Fisch. & Mey. Kindb. Monog. Lep. 16.—A very robust and viscid perennial, with large fleshy roots: not rare, on the north side, near the sea, among rocks.

36. *PENTACÆNA RAMOSISSIMA*, Hook. Bot. Misc. iii. 338.—Low bluffs near the sea, toward the west end.

37. *CALANDRINIA MENZIESII*, Hook. Fl. Bor. Am. i. 223.

38. *CLAYTONIA PERFOLIATA*, Donn, Bot. Mag. t. 1336.

39. *MALVA PARVIFLORA*, Linn. Amœn. iii, 416.—Less common than on the mainland, where it is called *M. borealis*; but it is a most distinct species.

40. *MALVASTRUM THURBERI*, Gray. var. *LAXIFLORUM*, Gray. Proc. Am. Acad. xxii. 291.—Rare; only two bushes seen, and these under the protection of large opuntias; perhaps thus kept from the sheep.

41. *ERODIUM CICUTARUM*, l'Her.; Ait. Hort. Kew. Ed. 1, ii. 414.

42. *ERODIUM MOSCHATUM*, Willd. Sp. Pl. iii. 631.

43. *RHAMNUS INSULARIS*, Kellogg., Proc. Cal. Acad. ii. 37?—Tree often 20 feet high, the naked trunks 4—5 inches

in diameter, clothed with a smooth light gray bark: branches few and open: leaves oblong-oval, commonly 3 inches long, including the half-inch petiole, and $1\frac{3}{4}$ inches broad, obtuse at both ends, mucronate at apex, the margin slightly but very regularly glandular-crenulate: color and texture of leaf as in *R. crocea*; fruit also the same except as to size, being much larger.

The tree here spoken of, although receiving its best development on Santa Cruz, is well known in western California from Lake county southward along the Mt. Diablo range, and in herbarium specimens may, with some excuse be referred, as it long has been, to Nuttall's *R. crocea*; but no one in the field can confound the two. I saw the same on Cedros Island two years ago. Yet there is a little doubt about its being the plant described by the late Dr. Kellogg. But in view of their probable identity I dare not propose a new name for what, if it be the same, has already two by the same author, the other one being *R. ilicifolia*.

44. *CEANOTHUS CRASSIFOLIUS*, Torr. Pac. R. Rep. iv. 75; Bot. Mex. Bound. 46. t. 11.—Not rare, yet nowhere forming thickets.

45. *CEANOTHUS ARBOREUS*, Greene (see page 144).

46. *ACER MACROPHYLLUM*, Pursh, Fl. i. 267.—Common in deep cañons of the north side, and very luxuriant.

47. *RHUS DIVERSILOBA*, Torr. & Gray, Fl. i. 218.—North side, rare.

48. *RHUS INTEGRIFOLIA*, Benth. & Hook. Gen. Pl. i. 419. Common on the northward slope, and of shapely tree-like proportions, much larger than ever seen on the mainland.

49. *RHUS OVATA*, Watson, Proc. Am. Acad. xx. 358.—Interior of the island, where it is common.

50. *LUPINUS CHAMISSONIS*, Esch. Mem. Acad. Petrop. x. 288.—Interior; also on islets near the shore; shrub of good size.

51. *LUPINUS AFFINIS*, Agh. Syn. Lup. 20.
52. *LUPINUS NANUS*, Dougl. Benth. Hort. Trans., new ser. i. 409. t. 14.
53. *LUPINUS TRUNCATUS*, Nutt.; Hook. & Arn. Bot. Beech. 336.
54. *LUPINUS HIRSUTISSIMUS*, Benth. Hort. Trans. l. c.
55. *LUPINUS UMBELLATUS*, Greene (see page 145).
56. *LUPINUS MICROCARPUS*, Sims. Bot. Mag. t. 2413.—All the above annual species appear in the interior only. Some of them may easily have been introduced from the mainland with seed of grain.
57. *TRIFOLIUM CILIATUM*, Nutt. Pl. Gamb. 152.
58. *TRIFOLIUM EXILE*, Greene, Pittonia. i. 6.
59. *TRIFOLIUM TRIDENTATUM*, Lindl. Bot. Reg. t. 1070.
60. *TRIFOLIUM MICRODON*, Hook. & Arn. Bot. Beech. 330 t. 79.
61. *TRIFOLIUM MICROCEPHALUM*, Pursh, Fl. ii. 478.
62. *TRIFOLIUM FUCATUM*, Lindl. Bot. Reg. t. 1883.
63. *TRIFOLIUM AMPECTENS*, Torr. & Gray, l. c. 319.
64. *MELILOTUS PARVIFLORA*, Desf. Fl. Atl. ii. 192.
65. *MEDICAGO DENTICULATA*, Willd ; DC. Prod. ii. 176.
66. *SYRMATium DENDROIDEUM*, Greene (see page 146).
67. *SYRMATium PATENS*, Greene (see page 147).
68. *SYRMATium NIVEUM*, Greene (see page 148).
69. *HOSACKIA ? OCCULTA*. Growing parts of the plant vil-lous-canescant, the older glabrate and green: leaflets 6, one

of the lateral wanting, membranaceous, cuneate-oblong, an inch long, the apex acute: flower and fruit unknown.

Here and there a seedling of this obscure but unquestionably new species was found in gravelly dry beds of streams in several parts of the island. I judge the perfect plant to be a perennial or a shrub of the mountain sides or summits, but I could never find it. An annual would have been in fruit at the late summer time; but these gave no sign of flower, even. The habit is rather that of *Syrmatium*, but the leaves are too ample for that genus. I have named and thus defined what I have of this variety, both hoping that future search may be rewarded with perfect specimens, yet fearing lest it be one of the insular species now on the verge of extinction, like *Syrmatium niveum*.

70. *HOSACKIA PARVIFLORA*, Benth. Bot. Reg. t. 1257.

71. *HOSACKIA STRIGOSA*, Nutt.; Torr. & Gray. Fl. i. 226.

72. *HOSACKIA MARITIMA*, Nutt. l. c.

73. *HOSACKIA SUBPINNATA*, Torr. & Gray. l. c.

74. *HOSACKIA PURSHIANA*, Benth. l. c.—Only two or three plants seen, and these near a Chinese fishing camp, at the south side; so, no doubt of recent introduction.

75. *ASTRAGALUS DIDYMOCARPUS*, Hook. & Arn. Bot. Beech. 334. t. 81.

76. *ASTRAGALUS LEUCOPSIS*, Torr. & Gray, Bot. Mex. Bound. 56. t. 16.—Southeastern shore; plentiful there, but not elsewhere seen.

77. *VICIA AMERICANA*, Muhl.; Willd. Sp. iii. 1096.

78. *VICIA EXIGUA*, Nutt.; Torr. & Gray, i. 272.

79. *LATHYRUS VESTITUS*, Nutt. l. c. 276.—Only one plant seen, and that in a cañon of the north side.

80. *PRUNUS OCCIDENTALIS*, Lyon, Bot. Gaz. xi. 202 &

333. Tree 15—25 feet high, with compact and well rounded head, the trunk with rough dark bark; evergreen; leaves usually ovate-acuminate, 3—4 inches long, 2—2½ inches broad, entire or remotely denticulate, rarely lanceolate-acuminate, 3 inches long, and $\frac{3}{4}$ inch broad, sometimes broadly ovate and abruptly acute, the margin spinose-serrate: inflorescence racemose: drupe orbicular, slightly compressed laterally, $\frac{3}{4}$ inch in length and breadth, with a very conspicuous suture on one side, dark red-purple, the thin pulp sweet, with also a bitter-almond flavor, but no acidity or astringency: putamen thin, rather firm-cartilaginous than ligneous.

Very common on all parts of the island; only occasionally exhibiting the very narrow leaves which I have described: the spinose-serrate foliage mostly appertaining to young trees.

Mr. Lyon cites no place where Nuttall published such a name as *Prunus occidentalis*, and I can find none. Moreover, Nuttall in common with very many able botanists, held that cherries and plums are of distinct genera, and this, if he named it even in manuscript, he must have called *Cerasus occidentalis*, rather than *Prunus*.

81. RUBUS URSINUS, Cham. and Schlect. Linnæa. ii. 11.—Rare near the shore on the north side: apparently not yet of fruiting age.

82. CERCOCARPUS BETULÆFOLIUS, Nutt.; Hook. Ic. t. 323. Trees often 18—25 feet high, with clean trunk and smooth light gray bark, the branches somewhat drooping, the whole habit very unlike that of *C. parvifolius*: leaves not rarely 2½ inches long and 1½ inches broad: young twigs with the odor and flavor of the black birch, and it was doubtless in reference to this quality as much as to the morphology of the foliage that Nuttall, who knew all about the tree, named it (ungrammatically) *C. betuloides*.

83. *ADENOSTOMA FASCICULATUM*, Hook. & Arn. Bot. Beech. 139. t. 30.—Common on hills everywhere, and much more luxuriant and tall than on the mainland.

84. *ROSA CALIFORNICA*, Cham. & Schlect. Linnæa. ii. 35. Common along streams.

85. *HETEROMELES ARBUTIFOLIA*, Røemer, Syn. Monogr. iii. 105.—The most common tree on all hillsides sloping northward. It is never found in such abundance on the mainland.

86. *LYONOTHAMNUS ASPLENIFOLIUS*, Greene, Bull. Cal. Acad. i. 187 & ii. 149. t. 6.

87. *SAXIFRAGA MALVÆFOLIA*, Greene, Bull. Torr. Club. ix. 121.—Still known only in the specimens of Kellogg & Harford.

88. *HEUCHERA MAXIMA*, Greene. (See page 149.)

89. *RIBES SUBVESTITUM*, Hook. & Arn.?—A single bush, not fruiting and seemingly young, was found in a deep cañon on the north side.

90. *TILLEA MINIMA*, Miers. Chil. ii. 530.

91. *COTYLEDON LANCEOLATA*, Watson, Bot. Cal. i. 211.—Abundant on cliffs near the sea.

92. *COTYLEDON LAXA*, Watson, l. c, 212²—In cañons back from the sea; plants too large, and too little glaucous to be well referable to this species.

93. *LYTHRUM CALIFORNICUM*, Torr. & Gray, Fl. i. 482.—Rare; found only in a springy place near the summit of the island.

94. *ZAUSCHNERIA CALIFORNICA*, Presl. Rel. Hænk. ii. 28, t. 52.—Low hills of the northward slope; frequent.

95. *ZAUSCHNERIA VILLOSA*, Greene, Pittonia, i. 27.—Abundant along stream banks in the interior.

96. *ZAUSCHNERIA CANA*, Greene, l. c. 28.—With the last and equally plentiful.

97. *EPILOBRIUM COLORATUM*, Muhl.; Willd. Enum. i. 411. Only one or two plants seen.

98. *EULOBUS CALIFORNICUS*, Nutt.; Torr. & Gray, Fl. i. 515.—In a dry sunny cañon opening to the south, or the north side; an enormous growth of the species, several plants more than six feet high.

99. *ÆNOTHERA HOOKERI*, Torr. & Gray, l. c. 493.—Along streamlets in the higher parts of the island; same as the mainland plant commonly called a variety of *Æ. biennis*, which it can hardly be.

100. *ÆNOTHERA BISTORTA*, Nutt.; Torr. & Gray, l. c. i. 508.

101. *ÆNOTHERA CHEIRANTHIFOLIA*, Hornem. Bot. Reg. t. 1040.

102. *GODETIA PURPUREA*, Watson, Bot. Cal. i. 229.—Frequent in the interior valley on grassy slopes.

103. *GODETIA EPILOBIODES*, Watson, l. c. 231.—North side, in shady places; plentiful.

104. *CLARKIA ELEGANS*, Dougl.; Bot. Reg. t. 1575.—Apparently scarce.

105. *MENTZELIA MICRANTHA*, Torr. & Gray, Fl. i. 535.—Frequent in sunny places in cañons opening into Prisoner's Harbor.

106. *ECHINOCYSTIS MACROCARPA*, Greene, Bull. Cal. Acad. i. 188.—Common.

107. *ECHINOCYSTIS GUADALUPENSIS*, Cogniaux in DC. Mon. Phan. iii. 819.—Abundant on the north side.

108. *OPUNTIA ENGELMANNI*, Salm. var. (?) *LITTORALIS*, En-

gelm. Bot. Cal. i, 248.—Abundant on open hills of the lower parts of the island.

109. *MESEMBRIANTHEMUM ÆQUILATERALE*, Haw. Misc. Nat. 77.—In masses on high rocks overhanging the sea, on the north side, common.

110. *MESEMBRIANTHEMUM CRYSTALLINUM*, Linn. Sp. Pl. 480.—Common at the west end, but not seen elsewhere.

111.—*SANICULA LACINIATA*, Hook & Arn. Bot. Beech. 347. A single specimen a little back from the shore, on the north side.

112. *CONIUM MACULATUM*, Linn. Sp. Pl. 243.—Bank of stream near cultivated ground, seeming well established.

113. *FÆNICULUM OFFICINALE*, All. Fl. Pedem. ii. 25.—Thoroughly established on hillsides near the landing of Prisoner's Harbor.

114. *APIASTRUM ANGUSTIFOLIUM*, Nutt.; Torr. & Gray, Fl. i. 644.

115. *BERULA ANGUSTIFOLIA*, Koch. Deutschl. Fl. ii. 433. Springy places near the sea, in Laguna Cañon on the south side.

116. *PEUCEDANUM* ——— ? On hillsides in the interior; stem and leaves dead, the species consequently undeterminable.

117. *DAUCUS PUSILLUS*, Michx. Fl. i. 164.—Very abundant and rank; often two feet high.

118. *SAMBUCUS GLAUCA*, Nutt.; Torr. & Gray, Fl. ii. 13. Not common.

119. *SYMPHORICARPUS MOLLIS*, Nutt. l. c. 4.—Like the last occurring only here and there in open cañons toward the sea, on the north side.

120. *LONICERA HISPIDULA*, Dougl.; Torr. & Gray, l. c. 5. Only one plant seen, and that with the two preceding species.

121. *LONICERA SUBSPICATA*, Hook. & Arn. Bot. Beech. 349.—South side near the sea; frequent.

122. *GALIUM APARINE*, Linn. Sp. Pl. 157.

123. *GALIUM ANGUSTIFOLIUM*, Nutt.; Torr. & Gray, l. c. 22.—Rocky places low down on the north side; not frequent.

124. *GALIUM FLACCIDUM*, Greene, Pittonia, i. 34.

125. *GALIUM BUXIFOLIUM*, Greene (see page 150).—Near *G. Catalinense*, Gray, but foliage of different texture and form, and the nodes of the stem lacking the “tumid ring” of that species.

126. *BRICKELLIA CALIFORNICA*, Gray, Pl. Fendl. 64.—In sunny open places among the cañons of the north side; quite as shrubby as the New Mexican plant called *B. Wrightii*, which is doubtless the same thing, specifically at least.

127. *GRINDELIA ROBUSTA*, Nutt. Trans. Am. Phil. Soc. vii. 314.—Interior; not common.

128. *APLOPAPPUS SQUARROSUS*, Hook & Arn. Bot. Beech. 146.—Frequent southward in the interior.

129. *BIGELOVIA VENETA*, Gray, Syn. Fl. i. 2, 142.—With the last and as frequent, but neither of them in any abundance as on the mainland.

130. *BIGELOVIA VENETA*, var. *SEDROIDES*.—Stems woody at base but wholly prostrate and less than a foot long: leaves obovate, coarsely serrate, thick and succulent: heads rather large, crowded in a terminal corymb.

On the edges of low cliffs overhanging the sea, on the north side of the island; at a short distance would be mis-

taken for a sedum; when fresh seeming like a very distinct species of its genus; but the dried specimens go readily for a form of *B. veneta*.

131. *SOLIDAGO CALIFORNICA*, Nutt. Trans. Am. Phil. Soc. vii. 327.—Rare; found in only two or three localities, on the north side; specimens of prodigious size, some being more than five feet high.

132. *CORETHROGYNE FILAGINIFOLIA*, Nutt. l. c. 290.—Rather scarce; seen only in the interior.

133. *HAZARDIA DETONSA*, Greene, Pittonia, i. 29.

134. *HAZARDIA SERRATA*, Greene, l. c. 30.

135. *ASTER RADULINUS*, Gray, Proc. Am. Acad. viii. 388. Rather common in open places of the wooded northward side.

136. *ERIGERON CANADENSIS*, Linn. Sp. Pl. 863.—Only one plant seen, and that not yet in flower.

137. *ERIGERON GLAUCUS*, Ker. Bot. Reg. t. 10.—Abundant on cliffs all along the northern shore.

138. *ERIGERON STENOPHYLLUS*, Nutt. Pl. Gamb. 176; Greene, Bull. Cal. Acad. i. 88, not of Gray.—Frequent on the northern slope.

139. *CONYZA COULTERI*, Gray, Proc. Am. Acad. vii. 355. A fair growth of this plant, not yet in flower, was found in a field of alfalfa, but fell by the sickle shortly after the time of my observing it. It may thus have failed to become established.

140. *BACCHARIS CONSANGUINEA*, DC. Prod. v. 408.—Not at all common.

141. *BACCHARIS PLUMMERÆ*, Gray. Am. Acad. xv. 48.—Growing luxuriantly in the cañon back of Prisoner's Harbor landing.

142. *BACCHARIS DOUGLASHII*, DC. l. c. 400.—Not common.

143. *BACCHARIS VIMINEA*, DC. l. c.—Dry beds of streams on the south side only, near the sea.

144. *MICROPUS CALIFORNICUS*, Fisch. & May. Ind. Sem. Petrop. 1835, 42.

145. *FILAGO CALIFORNICA*, Nutt. Trans. Am. Phil. Soc. vii. 405.

146. *GNAPHALIUM SPRENGELII*, Hook & Arn. Bot. Beech. 150.

147. *GNAPHALIUM RAMOSISSIMUM*, Nutt. Pl. Gamb. 172.

148. *GNAPHALIUM DECURRENS*, var. *CALIFORNICUM*, Gray, Bot. Cal. i. 141.

149. *GNAPHALIUM PURPUREUM*, Linn. Sp. Pl. 854.

150. *AMBROSIA PSILOSTACHYA*, DC. l. c. 526.

151. *FRANSERIA BIPINNATIFIDA*, Nutt. Trans. Am. Phil. Soc. vii. 507.

152. *XANTHIUM CANADENSE*, Mill. Dict. ed. 8.—One plant, fruiting at a Chinese fishing camp near the southern shore; at present therefore merely adventive.

153. *HELIANTHUS ANNUUS*, Linn. Sp. Pl. 904.—In a grain field; the native state of the plant.

154. *ENCELIA CALIFORNICA*, Nutt. l. c. 357.—Common near the sea, on the south side.

155. *LEPTOSYNE GIGANTEA*, Kellogg, Proc. Cal. Acad. iv. 198.—Frequent on cliffs toward the sea on the north side, but preferring islet rocks where sea fowls nest, in which places it grows in greatest abundance. The plant is described by sailors and fishermen as making a fine show during its flowering season, which is said to be February and March.

156. *MADIA FILIPES*, Gray, Proc. Am. Acad. ix. 189.—Abundant on the north side everywhere.

157. *HEMIZONIA FASCICULATA*, Torr. & Gray, Fl. ii. 397.—A low, somewhat congested form, on open grassy lands toward the sea, on the north side; abundant in its several localities.

158. *ACHYRACHENA MOLLIS*, Schauer.; DC. l. c. 292.—In the interior only.

159. *LAYIA PLATYGLOSSA*, Gray, Pl. Fendl. 103?—Not the variety *breviseta* of the nearest mainland, but the pappus of full length, and the awns manifestly flattened and broadest above the base; very likely a distinct species, but the specimens too old.

160. *VENEGASIA CARPESIOIDES*, DC. l. c. v. 43.—Deep cañons on the north; frequent.

161. *PERITYLE FITCHII*, Torr. Pac. R. Rep. iv. 100.—Clayey banks near the sea, on the south side: herbage resinous-viscid and strongly aromatic, thus most readily distinguished from *P. Californica*, which is scentless and nearly or quite glabrous.

162. *BERIA PALMERI*, var. *CLEMENTINA*, Gray, Syn. Fl. Suppl. 452.—Common on the north side, and variable in size: pappus alike in ray and disk, the paleæ invariably four only, in both the plant of Santa Cruz and that of San Clemente, although this fact does not appear to have been observed by the author. The same plant is common near the shores of San Diego Bay, where I collected it in 1885; also from the Coronados Islands I brought specimens of what would appear to be the same, except that in these there is no pappus at all.

163. *ERIOPHYLLUM CONFERTIFLORUM*, Gray, Proc. Am. Acad. xix. 25.—Frequent on the north side.

164. *ERIOPHYLLUM STÆCHADIFOLIUM*, Lag. var. *DEPRESSUM*, Stems stout, a foot long or less, depressed, forming a low hemispherical tuft: leaves broad and with about two pairs of divaricate linear-oblong lobes. A plant in aspect extremely unlike the continental type of the species; but the flowers and fruit present no characters. Frequent on cliffs near the sea, on the north side only.

165. *AMBLYOPAPPUS PUSILLUS*, Hook. & Arn. Journ. Bot. iii. 321.—Near the shores only.

166. *ACHILLEA MILLEFOLIUM*, Linn. Sp. Pl. 899.—Only on the north side, and rather scarce.

167. *ARTEMISIA CALIFORNICA*, Less. Linnæa. vi. 523.—Frequent, but nowhere plentiful.

168. *ARTEMISIA LUDOVICIANA*, Nutt.; Torr. & Gray, Fl. ii. 420.—The common Californian form; but only one tuft of it seen on the island; that on the north side.

169. *LEPIDOSPARTUM SQUAMATUM*, Gray, Proc. Am. Acad. xix. 50.—On a sandy tract in the interior.

170. *SENECIO DOUGLASII*, DC. Prod. vi. 429.—Interior; only two shrubs of it seen, but these large and beautiful.

171. *CNICUS LILACINUS*.¹ Near *C. occidentalis*, but more slender, much less tomentose, the leaves glabrate above: heads smaller, the long herbaceous-acerose tips of the bracts strongly incurved: corollas lilac-purple, short.—Interior of the island; infrequent.

172. *SILYBUM MARIANUM*, Gærtn. Fruct. et Sem. Pl. ii. 378.—Abundant in the sandy beds of the broader cañons, both north and south, forming thickets impenetrable at the growing season of the year.

¹ Mr. Parish has sent me from San Bernardino what must be the same named by him as new, "*C. neglectus*;" but that name holds for an Old World species.

173. *CENTAUREA MELITENSIS*, Linn. Sp. Pl. 917.—Not at all prevalent as in the continental fields and waste places.

174. *PEREZIA MICROCEPHALA*, Gray, Pl. Wright. i. 127.—Quite common at the north.

175. *STEPHANOMERIA ELATA*, Nutt. Pl. Gamb. 173 ?.²—Very common on the north side; often six feet high.

176. *STEPHANOMERIA VIRGATA*, Benth. Bot. Sulph. 32 ?. As frequent on the south side of the island as the last is at the north. Of different habit from the mainland plant bearing this name; but akenes and pappus the same.

177. *STEPHANOMERIA TOMENTOSA*, Greene (see page 152).

178. *STEPHANOMERIA CICHORIACEA*, Gray, Proc. Am. Acad. v. 552.—Very common, in the crevices of high precipitous ledges, chiefly in the interior.

179. *RAFINESQUIA CALIFORNICA*, Nutt. Trans. Am. Phil. Soc. vii. 429.—Very common at the north.

180. *HYPOCHÆRIS GLABRA*, Linn. Mant. 2. 460.

181. *CALAIS LINEARIFOLIA*, DC. Prod. vii. 85.—Frequent, as on the mainland, and in the same tall state (often more than two feet high), which occurs about San Diego.

182. *CALAIS PLURISETA*, Greene, Pittonia. i. 34.—Plants now growing from seed exhibit leaves laciniate-pinnatifid.

183. *MALACOTHRIX TENUIFOLIA*, Torr. & Gray, Fl. ii. 487. Precipitous places near the sea, at the north; common.

184. *MALACOTHRIX INCANÀ*, Torr. & Gray, l. c. 486 (see page 153).

185. *MALACOTHRIX INDECORA*, Greene (see page 152).

² Precisely the same plant, whatever it be, was seen by me, on my way home from the islands growing abundantly, on hillsides, at Port Harford, in San Luis Obispo county.

186. *MALACOTHRIX SQUALIDA*, Greene (see page 152).
187. *HIERACIUM ARGUTUM*, Nutt. Trans. Am. Phil. Soc. vii. 447.—Common in bushy places at the north.
188. *TROXIMON HETEROPHYLLUM*, Greene, Bull. Torr. Club. x. 88.—The typical form.
189. *SONCHUS OLERACEUS*, Linn. Sp. Pl. 794.
190. *SONCHUS ASPER*, Fuchs. Hist. 674 (A. D. 1542).
191. *SPECULARIA PERFOLIATA*, A. DC. Torr. Fl. N. Y. i. 428, t. 65.
192. *VACCINIUM OVATUM*, Pursh. Fl. i. 290.—Pine woods at the summit of the island, toward the west end.
193. *ARCTOSTAPHYLOS TOMENTOSA*, Dougl. Bot. Reg. t. 1791.—Forming low thickets near the summit, westward.
194. *ARCTOSTAPHYLOS PUNGENS*, HBK. Nov. Gen. & Spec. iii. 278.—Abundant, but at lower altitudes than the preceding.
195. *COMAROSTAPHYLIS DIVERSIFOLIA* = *Arctostaphylos diversifolia*, Parry; Gray, Syn. Fl. Suppl. 397.—A handsome small tree, 12—20 feet high, flowering in July, having the external appearance, as well as the characteristic inflorescence of our northwestern *arbutus*, with no likeness at all to the *manzanitas*; and, if fruit characters are of the value attributed to them in these *Ericaceæ* generally, *Comarostaphylis* is a very good genus; otherwise this tree will be an *Arbutus*, not an *Arctostaphylos*.
196. *DODECATHEON JEFFREYI*, Moore, Fl. des Serres. xvi. 99, t. 1662.—Hillsides of the interior; common.
197. *SAMOLUS VALERANDI*, var. *AMERICANUS*, Gray, Man. ed. 2. 274.—Wet places, in deep gorges, under dripping precipices, near the northern shores.

198. ERYTHRÆA DOUGLASII, Gray, Bot. Cal. i. 480.
199. GILIA ATRACTYLOIDES, Steud. Nom. i. 683.
200. GILIA FILIFOLIA, Nutt. Pl. Gamb. 156.
201. GILIA MULTICAULIS, Benth.
202. NEMOPHILA RACEMOSA, Nutt.; Gray, Proc. Am. Acad.
x. 315.
203. EUCRYPTA CHRYSANTHEMIFOLIA, Greene, Bull. Cal.
Acad. i. 200.
204. PHACELIA HISPIDA, Gray, 2. i. 161.
205. PHACELIA SUFFRUTESCENS, Parry, Proc. Davenp.
Acad. iv. 38.
206. PHACELIA PARRYI, Torr. Bot. Mex. Bound. 144.
207. EMMENANTHE PENDULIFLORA, Benth. Trans. Linn.
Soc. xvii. 281.
208. PECTOCARYA PENICILLATA, A. DC. Prod. x. 120.
209. KRYNITZKIA LEOCARPA, Fisch. & Mey. Sem. Petrop.
1835, 36.
210. KRYNITZKIA MICROMERES, Gray, Proc. Am. Acad. xx.
274.
211. KRYNITZKIA JONESII, Gray, l. c.
212. PLAGIOBOTHRYS CALIFORNICUS=*Echidiocarya Cali-
fornica*, Gray, Proc. Am. Acad. xii. 164 (1877); *Plagiobothrys
Cooperi*, Gray, l. c. xx. 285 (1884).
213. HELIOTROPIMUM CURASSAVICUM, Linn. Sp. Pl. 130.
214. AMSINCKIA LYCOPSOIDES, Lehm. Sem. Hamb. 1831, 7.
215. AMSINCKIA INTERMEDIA, Fisch. & Mey. Sem. Petrop.
1835, 26.

216. *CONVOLVULUS MACROSTEGIUS*, Greene, Bull. Cal. Acad. i. 208.—Abundant on the north side, suffrutescent, the stems scarcely twining, but trailing several yards over rocks and bushes. The peculiar inflorescence of this species attains a very remarkable development on this island. The flowers are arranged in a forked cyme, commonly five and seven, sometimes eleven in each cyme, every flower being separately large-foliaceous-bracted, a pair of somewhat larger bracts subtending the whole cyme. The corollas are developed, of course at the rate of one a day only, on each fork of the cyme. They are little larger than those of *C. occidentalis*, which is just as common at Santa Barbara on the opposite side of the channel, but of which no trace is found on the island.

217. *CONVOLVULUS ARVENSIS*, Linn. l. c. 153.—In a field near the principal settlement. Only a few plants, hence no doubt of recent introduction.

218. *CUSCUTA SUBINCLUSA*, Durand & Hilgard, Journ. Acad. Philad. ser. 2. iii. 42.—Not at all frequent, and rather depauperate.

219. *SOLANUM DOUGLASII*, Dunal. DC. Prod. xiii. 48.—Quite rare.

220. *SOLANUM XANTI*, var. *WALLACEI*, Gray, Proc. Am. Acad. xi. 90.—Frequent, but far less common than on Guadalupe.

221. *DATURA METELOIDES*, DC. Prod. xiii. 544.—In cañons of the northern and western parts of the island.

222. *NICOTIANA CLEVELANDI*, Gray, Syn. Fl. 242.—Like the typical mainland form, and not approaching *N. petuniiflora* of Guadalupe.

223. *LINARIA CANADENSIS*, Dum. Chav. Mon. 149.—

224. *ANTIRRHINUM NUTTALLIANUM*, Benth. DC. Prod. x. 592.—Rocky steeps, near the sea; common and very robust.

225. *ANTIRRHINUM STRICTUM*, Gray, Proc. Am. Acad. vii. 375.

226. *PENTSTEMON CORDIFOLIUS*, Benth. DC. Prod. x. 329.—With woody stems an inch thick, often climbing twenty feet among the branches of trees.

227. *DIPLACUS ARACHNOIDEUS*, Greene, Bull. Cal. Acad. i. 210.—Common in the higher parts of the island.

228. *DIPLACUS PARVIFLORUS*, Greene, Pittonia, i. 36.

229. *MIMULUS CARDINALIS*, Dougl. Lindl. Hort. Trans. ii. 70. t. 3.—Common and extremely luxuriant under dripping precipices and in deep cañons of the north side.

230. *MIMULUS FLORIBUNDUS*, Dougl. Lindl. Bot. Reg. t. 1125.—But one plant seen; in a streamlet well toward the summit.

231. *MIMULUS NASUTUS*, Greene, Bull. Cal. Acad. i. 112. Very abundant on the north side, in shady ravines.

232. *CASTILLEIA AFFINIS*, Hook & Arn. Bot. Beech. 154. Rare; near the summit.

233. *CASTILLEIA HOLOLEUCA*, Greene, W. Am. Sc. iii. 3: Pittonia. i. 38.—Common on hills of the interior; forming no small part of the brushwood in some places.

234. *ORTHOCARPUS DENSIFLORUS*, Benth. DC. l. c. 536.—Grassy slopes in open ground, on the north side.

235. *APHYLLON TUBEROSUM*, Gray, Bot. Cal. i. 585.—A single specimen at the west end.

236. *VERBENA PROSTRATA*, R. Br. Hort. Kew. iv. 41.—Only one small specimen, near the sea shore, on the north side.

237. *SPHACELE FRAGRANS*, Greene, Pittonia. i. 38.

238. *SALVIA COLUMBARÆ*, Benth. Lab. 302.

239. *AUDIBERTIA PALMERI*, Gray, Bot. Cal. i. 601.—Widely dispersed, the bushes large and well formed, but seldom met with, never growing in masses.

240. *STACHYS ACUMINATA*.—Stems 2—3 feet high, from rootstocks, retrorsely scabrous or hispid on the very acute angles: leaves ovate-acuminate, or triangular-lanceolate, mostly cordate, coarsely crenate, 2—3 inches long, on petioles of an inch or more, deep green and glabrate above, velvety-canescens beneath: spike naked, a foot or two long in age, the 4—6 flowered verticils an inch apart: calyx-teeth triangular, spine-tipped, less than half as long as the campanulate tube: corolla light purple, more than a half inch long, tube well exerted; lower lip about 4 lines long. Among loose rocks of the northward slope: flowering in July.

241. *PLANTAGO MAJOR*, Camerarius, Epit. 261 (A. D. 1586); Linn. Sp. Pl. 112 (A. D. 1753).—Near Prisoner's Harbor Landing.

242. *PLANTAGO PATAGONICA*, Jacq. Ic. Rar. t. 306.

243. *ERIOGONUM GRANDE*, Greene, Pittonia. i. 38.—All parts of the island.

244. *ERIOGONUM RUBESCENS*, Greene, l. c. 39.—Sandstone cliffs, at the western end.

245. *ERIOGONUM ARBORESCENS*, Greene, Bull. Cal. Acad. i. 11.—Common on hillsides of the northward slope, and in precipitous rocky places of all the cañons; about six feet high when well grown, shrubby and evergreen, forming a rounded and compact bush.

246. *RUMEX SALICIFOLIUS*, Weinm. DC. Prod. xiv. 47.

247. *RUMEX CRISPUS*, Linn. Sp. Pl. 335.

248. *RUMEX MARITIMUS*, Linn. l. c.

249. *RUMEX CONGLOMERATUS*, Murr. Prod. Fl. Goett. 52.

250. *POLYGONUM AVICULARE*, Linn. l. c. 362.
251. *CHORIZANTHE STATICOIDES*, Benth. Linn. Trans. xvii. 418.
252. *PTEROSTEGIA DRYMARIOIDES*, Fisch. & Mey. Sem. Petrop. ii. 23.
253. *MIRABILIS CALIFORNICA*, Gray, Bot. Mex. Bound. 173.
254. *ABRONIA MARITIMA*, Nutt.; Bot. Cal. ii. 4.—Abundant on all strips of beach occurring along the southern shore.
255. *ABRONIA UMBELLATA*, Lam. Ill. i. 469. t. 105.
256. *AMARANTUS ALBUS*, Linn. Sp. Pl. ed. 2. 1404.
257. *CHENOPODIUM MURALE*, Linn. Sp. Pl. 219.
258. *CHENOPODIUM ALBUM*, Linn. l. c.
259. *CHENOPODIUM AMBROSIOIDES*, Linn. l. c.—This and the three preceding weeds were seen in only a few specimens of each; none of them being thoroughly established.
260. *CHENOPODIUM CALIFORNICUM*, Watson. Bot. Cal. ii. 48.
261. *ATRIPLEX MICROCARPA*, Dietr. Syn. v. 536.—Frequent on the south side near the sea.
262. *ATRIPLEX LEUCOPHYLLA*, Dietr. l. c.—At the west end only.
263. *ATRIPLEX CALIFORNICA*, Moq. DC. Prod. xiii². 98. Rocky islets off the northern shore; also, in a remarkably robust fleshy form, at the west end.
264. *ATRIPLEX BREWERI*, Watson, Proc. Am. Acad. ix. 119.—Southern shore.
- 265.—*SUÆDA TORREYANA*, Watson, l. c. 88.—At the west end, abundant.

266. *URTICA HOLOSERICEA*, Nutt. Pl. Gamb. 183.—Seen in but two or three localities, not far from the shore, on the north side.

267. *URTICA URENS*, Linn. Sp. Pl. 984.

268. *PARIETARIA DEBILIS*, Forst. Prod. Fl. Austral. 73.

269. *EREMOCARPUS SETIGERUS*, Benth. Bot. Sulph. 53. t. 26.—Abundant in fields; perhaps brought in with seed of grain.

270. *RICINUS COMMUNIS*, Linn. Sp. Pl. 1007.—Growing spontaneously along the hills back from the landing, forming small trees. It is also thoroughly naturalized on stream banks in the vicinity of Santa Barbara on the mainland.

271. *SALIX LÆVIGATA*, Bebb. Bot. Cal. ii. 83.—Fine trees in many of the cañons at the north.

272. *SALIX LONGIFOLIA*, Muhl. DC. Prod. xvi². 214.—One bush, in flower, at the south side near the shore.

273. *SALIX LASIOLEPIS*, Benth. Pl. Hartw. 335.—With the last; a very pubescent form.

274. *POPULUS TRICHOCARPA*, Torr. Hook. Ic. t. 878.—Frequent in deep cañons at the north side; also more rarely at the south.

275. *QUERCUS DUMOSA*, Nutt. Sylv. i. 7.—Very common at the north; the smaller specimens of the open hill country frequently with spikes erect, and many of the flowers perfect, yielding a spike of a dozen acorns.

276. *QUERCUS CHRYSOLEPIS*, Liebm. Dansk. Vidensk. Forhandl. 1854, 173.—At the north, near the summit; not common.

277. *QUERCUS TOMENTELLA*, Engelm. Trans. St. Louis, Acad. iii. 393 —Frequent; the trees smaller than on Guadalupe.

278. *QUERCUS AGRIFOLIA*. Liebm. l. c. — A beautiful growth of this tree in every valley and broad cañon: also on the higher northern slope, on open hill tops, a more reduced and compacted form with all, or nearly all, the flowers perfect, and acorns consequently spicate.

279. *QUERCUS PARVULA*, Greene, Pittonia. i. 40.

280. *PINUS INSIGNIS*, Dougl. var. *BINATA*, Engelm. Bot. Cal. ii. 128.—Small trees, growing in a scattered way along the northward slope, but forming dense forests toward the summit and at the western end of the island.

281. *HABENARIA ELEGANS*, Bolander, Cat. Pl. San Francisco, 29.—Frequent on wooded hills at the north.

282. *SISYRINCHIUM BELLUM*, Watson, Proc. Am. Acad. xii. 277.—Interior only.

283. *BLOOMERIA AUREA*, Kellogg, Proc. Cal. Acad. ii. 11. Common on the north side, but extremely abundant in the interior; see page 386.

284. *BRODLEA INSULARIS*, Greene (see page 134).

285. *LILIUM HUMBOLDTII*, Rœzl & Leicht.; Duchartre, Obs. 105.—Very common in woods everywhere.

286. *CALOCHORTUS* ———. A species of the *Cyclobothra* section; common in woods of the north side; long past flowering, and not to be identified specifically.

287. *CALOCHORTUS* ———. A species of the true *Calochortus* (perhaps, indeed, several species); abundant on grassy slopes of the interior.

288. *ZYGADENUS FREMONTI*, Torr. Pac. R. Rep. vii. 20.

289. *TYPHA BRACTEATA*. Rather slender, 15—18 feet high, the staminate and pistillate spike each 12—16 inches long, separated by an interval of an inch or more, aggregate length of spike in the largest specimens fully 3 feet,

the staminate at flowering time subtended and partly embraced by a linear deciduous bract of its own length, and bearing 3—7 smaller somewhat scarious caducous ones above midway or near the apex: pollen simple.

In a marshy place near the sea on the south side, above the mouth of Laguna Cañon. A gigantic species, and one which will doubtless be found on the mainland southward, whenever our collectors shall cease to pass this genus by as one not meriting their care or notice. These insular plants were not out of flower at the late date of my finding them, namely, the 13th of August; but there was evidence that the mature spike would be an inch at least in thickness.

290. *ZOSTERA MARINA*, Linn. Sp. Pl. 968.—Found on the beach at the landing.

291. *PHYLLOSPADIX TORREYI*, Watson, Proc. Am. Acad. xiv. 303.—Abundant on rocks below tide mark along the northern shores.

292. *JUNCUS BALTICUS*, Dethard, Reichenb. Ic. Fl. Ger. ix. t. 411.—Interior; frequent.

293. *JUNCUS EFFUSUS*, Linn. Sp. Pl. 326.—On the south side; rare.

294. *JUNCUS BUFONIUS*, Linn. l. c. 328.

295. *CAREX* ———. Dry hills among bushes, long past fruiting.

296. *CAREX ANGUSTATA*, Boot. Hook. Fl. ii. 218.—Along streams in the northern cañons.

297. *PHALARIS CANARIENSIS*, Linn. l. c. 54.

298. *POLYPOGON MONSPELIENSIS*, Desf. Reichenb. l. c. i. 15. t. 91.

299. *MUHLENBERGIA DEBILIS*, Trin. Agrost. ii. 49.

300. *STIPA* ———. Apparently an undescribed species, but specimens too old.

301. AVENA FATUA, Linn. l. c. 80.
302. MELICA IMPERFECTA, Trin. Icon. Gram. t. 355.
303. DISTICHLIS SPICATA=*Uniola spicata*, Linn: *D. maritima*, Raf. Journ. Phys. lxxxix. 104.
304. BROMUS ———.
305. ELYMUS CONDENSATUS, Presl. Rel. Hænk. i. 265.
306. AGROPYRUM REPENS, Beauv. Reichenb. Ic. t. 120.
307. HORDEUM MURINUM, Linn. l. c. 85.
308. FESTUCA MYURUS, Linn. l. c. 74.
309. EQUISETUM ———. The specimens do not match any of our mainland forms, and possibly two species are represented.
310. POLYPODIUM CALIFORNICUM, Kaulf. Enum. 102.
311. PELLÆA ORNITHOPUS, Hook. Sp. Fil. ii. 143. t. 116.
312. PELLÆA ANDROMEDÆFOLIA, Fée. Gen. Fil. 129.
313. CHEILANTHES CALIFORNICA, Metten. Cheil. 44.
314. NOTHOLÆNA CANDIDA, Hook. l. c. 116.
315. PTERIS AQUILINA, Linn. l. c. 1075.
316. ADIANTUM PEDATUM, Linn. l. c. 1095.—A fine growth of this most beautiful fern (rare in California), in one of the principal cañons of the north side.
317. ADIANTUM CAPILLUS-VENERIS, Linn. l. c. 1096.
318. WOODWARDIA RADICANS, Smith. Mem. Acad. Turin. v. 412.
319. ASPIDIUM MUNITUM, Kaulf. Enum. 326.
320. ASPIDIUM RIGIDUM, Swartz, Syn. Fil. 53.

321. *ASPIDIUM* ———. A fern of more delicate texture than the preceding number, not well in fruit.

3. *Three New Species.*

HORKELIA KELLOGGII. Stems stout, ascending or nearly prostrate, a foot long or more, from a thick ligneous, very branching caudex: leaves of 5—7 pairs of obovate, coarsely and rather deeply toothed leaflets: calyx-tube cupuliform, a line deep and $2\frac{1}{2}$ lines broad; segments lanceolate, about 3 lines long, fully equalled by the oblong bracteoles: petals 3 lines long, spatulate-oblong, clear white: the subulate filaments also white, the 5 opposite the petals perceptibly shorter than the other 5.—*H. Californica*, var. *sericea*, Gray, Proc. Am. Acad. vi. 529; Bot. Cal. i. 181.

Most distinct from *H. Californica* in habit as well as in the color of the flowers and the very dissimilar proportions of tube and limb of the calyx. In that species the tube is not barely campanulate (much farther from cupuliform), it is even somewhat urceolate, and nearly equal to the limb itself in length. The peculiar pubescence of the present plant is a good character, and the only one heretofore mentioned by authors. The species is apparently very local, being now confined, in so far as I can discover, to two or three town lots, which still remain unoccupied, in the western part of Alameda, hence it is destined to an early extinction, unless some new locality can be discovered for it. The lots in which it is now growing are of a sandy soil and form part of a bluff little elevated above the beach. *H. Californica* is a common plant of the wooded hills on both sides of the Bay of San Francisco. The plant was originally discovered by the late Dr. Albert Kellogg, and may appropriately be dedicated to him who has so lately passed from among us.

HORKELIA PARRYI. Cæspitose, the slender stems 6—10 inches high: herbage green, and with a sparse soft pubescence and some glands about the inflorescence: leaflets

cuneate-obovate, toothed or cleft chiefly at the apex: cymes very loose: calyx altogether rotate, with no tube; bracteoles narrow and only half as long as the broadly-lanceolate segments: petals obovate-oblong, not unguiculate, but narrower at base, 3 lines long, far surpassing the calyx, clear white: filaments all subulate, those opposite the petals only $\frac{2}{3}$ the length of the other 5.

Lone, Amador county: collected long ago by Mr. Harry Edwards, and more recently by Mrs. Curran, and by Dr. Parry. A very pretty species, with showy flowers, which are altogether those of an ordinary *Potentilla*, save that the filaments are very strongly dilated; and the genus, as most authorities now think, is rather artificial, and should perhaps be suppressed, following Bentham and Hooker.

CONVOLVULUS BINGHAMÆ. Perennial from creeping root-stocks, the stems 3—6 feet long, twining or trailing: leaves glabrous, oval or oblong, rather abruptly acute, the base with a pair of obtuse parallel or very little divergent hastate lobes: peduncles 1-flowered: bracts oval to narrowly oblong, 4 lines long, flat and closely subtending and appressed to the calyx, which they are too small to half conceal: calyx 6—8 lines long: corolla pure white: stamens rather short, the tips of the anthers attaining to the base only of the linear stigmas.

In marshy places about Burton's Mound, in the city of Santa Barbara; collected in 1886, by Mrs. R. F. Bingham, and the writer. Its rhizomatous subterranean parts place it in close affinity with *C. sepium*, from which its peculiar bracts well distinguish it, and remove it far enough from the two suffrutescent species which are most common in the western parts of California, namely, *C. occidentalis* and *C. luteolus*. These two most distinct species have been very unfortunately run into one by their author, in the Synoptical Flora Supplement. Perhaps some imperfect specimens of the plant here defined as new may have led to this confusion; for the author speaks of some in which the bracts

are "oblong and barely equalling" the calyx. They are often narrowly oblong, but they are always shorter than the calyx and never broad enough to come near covering it.

This plant being removed, I may speak positively to the effect that there are no transitions between *C. occidentalis* and *C. luteolus*. In the former the broad, carinate-conuplicate leafy bracts are inserted close under the calyx, which they wholly conceal. In the latter the bracts are merely subulate small affairs, always situated at the good distance of a half inch or more below the calyx, their tips not reaching its base. The flowers of the former are one third larger, and their anthers equal or surpass the stigmas, while in *C. luteolus* the tips of the anthers come up only to the base of the stigma. The latter is a poor twiner, preferring to spread about over the ground or low bushes; although in age, like a grape vine, it will spread over the head of a small oak and hide it with its profusion of leaves and flowers. *C. occidentalis*, although it becomes shrubby or woody, is from first to last a close twiner, never trailing about, but its stems and branches always spirally twisted around their support: and finally, the two have each its own geographical limits. *C. occidentalis* is wrongly credited to the San Francisco region. I do not know of its occurrence north of Monterey, nor of the existence of *C. luteolus* south of that point. The corollas of both have an uncommon durability among those of their kindred. Those of *C. luteolus* I have long observed to gather up their folds loosely at nightfall of their first day, and unfold them again in the morning for the whole of the second day; and they commonly acquire a deep shade of purple for this second day of their existence. And now that I have the two species growing side by side at Berkeley, I find that the southern species, *C. occidentalis*, does the same, except that the corollas do not very perceptibly change their hue for the second day. I should perhaps say here that the corollas of the new *C. Binghamiæ*, like those of their ally, *C. sepium*, last for one day only.

ORNITHOLOGICAL OBSERVATIONS IN SAN DIEGO COUNTY.

BY W. OTTO EMERSON.

The months of January, February and March, 1884, found me storm-bound on the Volcano Mountains, about seventy-five miles northeast of San Diego. The intervals between January 15-20 and between April 6-28 were spent in Poway Valley, twenty-two miles north of San Diego.

The Volcano Mountains seem to be a spur from the main range, rising about 5,000 feet above sea level. Eastward as far as the eye can see lies the so-called desert. Westward among the valleys and tablelands (*mesas*) the country is sparsely settled. The western side of the range is well timbered with several species of oaks, while towards the north, dark, heavy belts of timber are seen.

Poway Valley is surrounded by high rolling hills; these in many places are bare and rocky; again, covered with patches of cacti. Black and white sage is the principal vegetation covering the sides of the many ravines. Very few trees of any kind are seen; these comprise oaks, elders, occasional sycamores and clumps of willows. The elders grow very large, the berries furnishing food for Robins, Mockingbirds, Bluebirds, House Finches, and others. The sycamores are the habitation of several species of rapacious birds. Numerous kinds of cacti are found, the one known as *cholla* being used by many birds to build their nests in.

In the present paper it is intended to show the relative abundance of the various species found on the Volcano Mountains in winter; also those of Poway Valley in winter, and of the latter place after the spring migrants had begun to arrive. The lists are somewhat incomplete, owing to my ill health preventing observations during the severest weather. The winter was an unusually severe one on the

mountains, snow often covering the ground to the depth of two feet. Nine inches fell during one night.

I am under obligations to Dr. J. G. Cooper and Mr. Robert Ridgway for identifying several of the species included in these lists. Specimens were taken of all excepting Golden Eagle, Turkey Buzzard, Crow, and Sandhill Crane.

Arriving on the mountains in January, bird life was met with in profusion, scattered among the trees and bushes, no storms having yet occurred to drive them down to the valleys or confine them to sheltered flats along the creeks. After the first hard rain storm they commenced moving lower down, and the first fall of snow, towards the latter part of January, sent them hurrying to the warmer valleys.

The species taken or seen on the mountains were as follows:

1. *Grus mexicana*.

SANDHILL CRANE.—A large flock was seen flying northward March 16th, and another on March 20th.

2. *Oreortyx pictus plumiferus*.

PLUMED PARTRIDGE.—A bevy of forty or more was seen in January. They were not as common as the Valley Partridge.

3. *Callipepla californica vallicola*.

VALLEY PARTRIDGE.—Abundant. This species withstands the cold and snow far better than its larger relative. The Plumed Partridge became scarce after the first heavy fall of snow, having gone to a lower altitude to winter.

4. *Cathartes aura*.

TURKEY VULTURE.—Only noticed on one occasion, when eight or nine were seen circling above the main ridge (February 22d).

5. *Accipiter velox*.

SHARP-SHINNED HAWK.—One seen February 22d.

6. *Accipiter cooperi*.

COOPER'S HAWK.—Tolerably common.

7. *Buteo borealis calurus*.

WESTERN RED-TAIL.—Common. Eggs were brought to me as early as February 20th.

8. *Archibuteo ferrugineus*.

FERRUGINEUS ROUGH-LEG.—A male was shot February 25th, at the foot of the mountains, by my friend Mr. Fred. Paine.

9. *Aquila chrysaetos*.

GOLDEN EAGLE.—Seen flying on several occasions. No doubt breeds in this vicinity.

10. *Falco sparverius*.

AMERICAN SPARROW HAWK.—One bird was seen March 1st.

11. *Bubo virginianus subarcticus*.

WESTERN HORNED OWL.—Sometimes heard calling at dusk from some oaks near the house.

12. *Dryobates villosus harrisi*.

HARRIS'S WOODPECKER.—One male taken.

13. *Melanerpes formicivorus bairdi*.

CALIFORNIAN WOODPECKER.—Common. In stormy weather remaining concealed in the oaks, but on sunny days coming about, with their glad *ēkup*, *ēkup*, *ēkup*.

14. *Colaptes cafer*.

RED-SHAFTED FLICKER.—Rare on the mountains.

15. *Trochilus anna*.

ANNA'S HUMMINGBIRD.—A male flew past the house the morning of March 11th, hurrying to leave a place where the snow lay over everything.

16. *Otocoris alpestris rubea*.

RUDDY HORNED LARK.—Common on open flats.

17. *Cyanocitta stelleri frontalis*.

BLUE-FRONTED JAY.—Common at all times.

18. *Aphelocoma californica*.

CALIFORNIA JAY.—Common. More social than the Blue-fronted Jay, coming about the corrals and sheds for scattered corn, and often going to the feed boxes to help themselves. Specimens which were taken differ considerably from the same species found at Haywards, Cal., being smaller and somewhat different in color.

19. *Corvus americanus*.

AMERICAN CROW.—Two or three pairs were seen about the ranch during the winter. A large colony had nesting sites in some willows at the foot of the mountain in the spring.

20. *Sturnella magna neglecta*.

WESTERN MEADOWLARK.—Rarely seen on the mountains.

21. *Scolecophagus cyanocephalus*.

BREWER'S BLACKBIRD.—Three males came around the house during a snow storm on February 11th; a female was seen on March 20th.

22. *Carpodacus frontalis rhodocolpus*.

CRIMSON HOUSE FINCH.—Not common. Heard one singing on February 22d.

23. *Spinus lawrencei*.

LAWRENCE'S GOLDFINCH.—A small flock was seen twice in January.

24. *Ammodramus sandwichensis alaudinus*.

WESTERN SAVANNA SPARROW.—A single specimen was taken March 9th.

25. *Chondestes grammacus strigatus*.

WESTERN LARK SPARROW.—Common in flocks about open ground.

26. *Zonotrichia gambeli*.

GAMBEL'S SPARROW.—Common.

27. *Zonotrichia coronata*.

GOLDEN CROWNED SPARROW.—Tolerably common. Associated with Gambel's Sparrow.

28. *Junco hyemalis oregonus*.

OREGON JUNCO.—Common.

29. *Melospiza fasciata heermanni*.

HEERMANN'S SONG SPARROW.—Rare.

30. *Melospiza lincolni*.

LINCOLN'S SPARROW.—The only individual seen was taken January 25th.

31. *Passerella iliaca unalaschensis*.

TOWNSEND'S SPARROW.—Common. A specimen which Mr. Ridgway has identified approaches closely to the variety *megarhyncha* in size of bill and coloration.

32. *Pipilo maculatus megalonyx*.

SPURRED TOWHEE.—Common. Could be heard singing on any clear morning from the top of low bushes.

33. *Pipilo fuscus crissalis*.

CALIFORNIAN TOWHEE.—Common.

34. *Tachycineta thalassina*.

VIOLET-GREEN SWALLOW.—First seen March 17th, early in the morning, but finding five inches of snow on the ground they circled about for three hours and then disappeared, returning April 1st, when I noticed them resting on bare oak twigs.

35. *Dendroica auduboni*.

AUDUBON'S WARBLER.—Was seen February 22d, towards the foot of the mountains.

36. *Harporhynchus redivivus*.

CALIFORNIAN THRASHER.—Heard singing on March 9th.

37. *Troglodytes ædon parkmanii*.

PARKMAN'S WREN.—One specimen was taken January 24th, and another seen on the 28th.

38. *Sitta carolinensis aculeata*.

SLENDER-BILLED NUTHATCH.—Seen and heard singing every day. Appeared to be looking for nesting sites March 1st.

39. *Parus inornatus*.

PLAIN TITMOUSE.—Common. The males were singing the latter part of March.

40. *Parus gambeli*.

MOUNTAIN CHICKADEE.—Common. Noticed them singing March 1st.

41. *Psaltriparus minimus californicus*.

CALIFORNIAN BUSH-TIT.—Seen February 24th, during a heavy snow storm, with a flock of the Mountain Chickadee.

42. *Regulus calendula*.

RUBY-CROWNED KINGLET.—Two birds were seen the last of March.

43. *Myadestes townsendii*.

TOWNSEND'S SOLITAIRE.—Only two or three were seen.

44. *Turdus aonalaschkæ*.

DWARF HERMIT THRUSH.—Rare. None were seen after February 22d.

45. *Merula migratoria propinqua*.

WESTERN ROBIN.—Common wherever the ground was bare and soft.

46. *Sialia mexicana*.

WESTERN BLUEBIRD.—Common. Mated by March 1st.

I left the Volcano Mountains on April 2d, and went into camp the same day at the foot of the mountains, on my return to Poway Valley. About dusk two Russet-backed

Thrushes were seen. On entering the Santa Isabel Valley next day, the Arkansas Kingbird was found in pairs perched upon dry weed-stalks. Crimson House Finch, Western Lark Sparrow, Western Meadowlark and Brewer's Blackbird, were common through the green fields, while the air above was merry with the twitter of many Cliff Swallows. Lower in the valley the following were seen: American Sparrow Hawk, Western Red-Tail, Bullock's Oriole, Purple Martin, Audubon's and Pileolated Warblers. On the plains I noticed Western Savanna Sparrow, Western Lark Sparrow, Crimson House Finch, Yellow-headed and Bicolored Blackbirds, flocks of Mountain Plover and Ruddy Horned Lark. A few pairs of Ash-throated Flycatchers, a species which arrives late, showed that the spring migration to San Diego county was far advanced. Cliff Swallows had commenced building under the eaves of an adobe house, and about a moist spot of ground several Killdeers were feeding. The lonesome notes of the Poor-will could be heard almost continually throughout the night.

In the following list of the birds of Poway Valley, seen or taken by me in April, I have included in their order those noticed in January. Such winter birds are indicated by *.

1. *Ægialitis vocifera*.

KILLDEER.—Tolerably common. Breeds.

*2. *Callipepla californica*.

CALIFORNIA PARTRIDGE.—Very plentiful among the cacti.

*3. *Zenaidura macroura*.

MOURNING DOVE.—Tolerably common.

4. *Pseudogryphus californianus*.

CALIFORNIA VULTURE.—I hardly expected to have the good fortune to see this rare bird, but one day I heard a sound, as of wind coming through the oaks, and saw a large shadow passing over the ground. Soon this bird of immense wings

went sailing by towards the mountains. I had time to note the bare, bright colored head, outstretched from the body, and then he was gone. This rare species is now confined to the mountains back from the coast. I have been told by Mr. Henry Chapman (now deceased) that they were once common in San Joaquin and Sacramento Valleys.

5. *Accipiter velox*.

SHARP-SHINNED HAWK.—One specimen was taken in January. Not afterwards seen.

*6. *Buteo borealis calurus*.

WESTERN RED-TAIL.—Common in the vicinity of trees.

7. *Falco sparverius*.

AMERICAN SPARROW HAWK.—Common.

8. *Strix pratineola*.

AMERICAN BARN OWL.—A few seen at dusk among oaks.

9. *Bubo virginianus subarcticus*.

WESTERN HORNED OWL.—Common.

*10. *Speotyto cunicularia hypogæa*.

BURROWING OWL.—Common. Fresh eggs were taken April 23d.

11. *Dryobates pubescens gairdnerii*.

GAIRDNER'S WOODPECKER.—Common among oak trees.

*12. *Colaptes cafer*.

RED-SHAFTED FLICKER.—Common.

13. *Phalænoptilus nuttalli*.

POOR-WILL.—Tolerably common.

14. *Chordeiles virginianus henryi*.

WESTERN NIGHTHAWK.—Common.

15. *Trochilus alexandri*.

BLACK-CHINNED HUMMINGBIRD.—Common. More so than any other of this genus. Fresh eggs were taken, and half-fledged young found April 23d.

16. *Trochilus anna*.

ANNA'S HUMMINGBIRD.—Rare. One male seen.

17. *Trochilus rufus*.

RUFIOUS HUMMINGBIRD.—Rare.

18. *Tyrannus verticalis*.

ARKANSAS KINGBIRD.—Common. Nests were ready to receive eggs by the last of April.

*19. *Tyrannus vociferans*.

CASSINS KINGBIRD.—Common. Nests about the same time as the Arkansas Kingbird, but the eggs are not distinguishable from those of that species.

20. *Myiarchus cinerascens*.

ASH-THROATED FLYCATCHER.—One pair seen.

*21. *Sayornis nigricans*.

BLACK PHOEBE.—Common. Eggs taken April 27th.

22. *Empidonax difficilis*.

BAIRD'S FLYCATCHER.—Was noticed only once, on April 8th.

*23. *Otocoris alpestris rubea*.

RUDDY HORNED LARK.—Tolerably common. Incubated eggs were found April 20th.

24. *Aphelocoma californica*.

CALIFORNIA JAY.—Common.

25. *Xanthocephalus xanthocephalus*.

YELLOW-HEADED BLACKBIRD.—Seen in small flocks. The male has an odd way of throwing his head to one side when singing.

26. *Agelaius gubernator*.

BICOLORED BLACKBIRD.—Common.

27. *Agelaius tricolor*.

TRICOLORED BLACKBIRD.—Tolerably common.

***28. *Sturnella magna neglecta*.**

WESTERN MEADOWLARK.—Tolerably common.

29. *Icterus cucullatus nelsoni*.

ARIZONA HOODED ORIOLE.—Common. Nests in gum trees were completed by the last of April. From the appearance of specimens taken I should judge that it required from two to three years for the males to attain full plumage.

30. *Icterus bullocki*.

BULLOCK'S ORIOLE.—Common. Not found near the vicinity of the nesting places of the Hooded Oriole.

31. *Scolecophagus cyanocephalus*.

BREWER'S BLACKBIRD.—Very common. Nests in pepper trees. One nest taken April 17th contained seven eggs.

***32. *Carpodacus frontalis rhodocolpus*.**

CRIMSON HOUSE FINCH.—Nest and fresh eggs taken April 18th.

***33. *Spinus psaltria*.**

ARKANSAS GOLDFINCH.—Tolerably common. Fed on young oak buds.

34. *Spinus lawrencei*.

LAWRENCE'S GOLDFINCH.—Common. Found large young and fresh eggs April 23d.

*35. *Poocætes gramineus confinis*.

WESTERN VESPER SPARROW.—Tolerably common.

*36. *Ammodramus sandwichensis alaudinus*.

WESTERN SAVANNA SPARROW.—Tolerably common.

*37. *Chondestes grammacus strigatus*.

WESTERN LARK SPARROW.—Common among clumps of cactus. Fresh eggs taken April 20th.

*38. *Zonotrichia gambeli*.

GAMBEL'S SPARROW.—Common.

39. *Spizella socialis arizonæ*.

WESTERN CHIPPING SPARROW.—Heard singing.

40. *Amphispiza belli*.

BELL'S SPARROW.—Tolerably common. Keeps among thick brush.

*41. *Pipilo fuscus crissalis*.

CALIFORNIAN TOWHEE.—Tolerably common. Was building by the middle of April.

42. *Habia melanocephala*.

BLACK-HEADED GROSBEAK.—A single male was seen.

43. *Passerina amœna*.

LAZULI BUNTING.—Rare.

44. *Petrochelidon lunifrons*.

CLIFF SWALLOW.—Common.

45. *Tachycineta thalassina*.

VIOLET-GREEN SWALLOW.—About ten birds were seen flying in a northerly direction April 10th.

*46. *Lanius ludovicianus excubitorides*.

WHITE-RUMPED SHRIKE.—Common.

47. *Vireo gilvus*.

WARBLING VIREO.—Was seen singing in the oaks.

48. *Dendroica æstiva*.

YELLOW WARBLER.—Rare. One male seen.

*49. *Dendroica auduboni*.

AUDUBON'S WARBLER.—A few seen in April.

50. *Geothlypis trichas occidentalis*.

WESTERN YELLOW THROAT.—Rare.

*51. *Mimus polyglottus*.

MOCKINGBIRD.—Could be heard singing morning and evening, and often on moonlight nights.

52. *Harporhynchus redivivus*.

CALIFORNIAN THRASHER.—Quite common throughout the low hills.

53. *Campylorhynchus brunneicapillus*.

CACTUS WREN.—Common. A nest and fresh eggs taken April 18th.

54. *Salpinctes obsoletus*.

ROCK WREN.—Tolerably common in suitable localities.

55. *Troglodytes aedon parkmanii*.

PARKMAN'S WREN.—Common.

*56. *Chamæa fasciata*.

WREN-TIT.—Tolerably common.

57. *Psaltriparus minimus californicus*.

CALIFORNIAN BUSH-TIT.—Found a nest with young, April 23d.

58. *Regulus calendula*.

RUBY-CROWNED KINGLET.—A male was seen April 27th.

59. *Polioptila cærulea*.

BLUE-GRAY GNATCATCHER.—Rare. Two males were taken in January.

60. *Turdus aonalaschkæ*.

DWARF HERMIT THRUSH.—Tolerably common in January. Fed upon the berries of the pepper tree.

*61. *Merula migratoria propinqua*.

WESTERN ROBIN.—Was seen in the valley April 28th.

62. *Sialia mexicana*.

WESTERN BLUEBIRD.—Very common among the pepper trees during my visit in January.

63. *Sialia arctica*.

MOUNTAIN BLUEBIRD.—A few seen about a plowed field in January. I was told that it was the first time that they had been seen in the valley.

DESMIDS OF THE PACIFIC COAST.

IDENTIFIED BY REV. FRANCIS WOLLE.

List of Desmids, etc., collected by Mrs. Hansen and Miss Haggin near Lake Tahoe, Aug., 1886:

1. *HYALOTHECA MUCOSA* (Mert.), Ralfs.
2. *BAMBUSINA BREBISSEI*, Kg.
3. *DESMIDIUM BAILEYI*, Ralfs.
4. *SPHÆROZOSMA EXCAVATUM*, Ralfs.
5. *SPHÆROZOSMA SERRATUM*, Bailey.
6. *PENIUM DIGITUS* (Ehrb.), Breb.
7. *PENIUM MINUTUM*, Cleve.
8. *PENIUM CURTUS*, Kirch.
9. *CLOSTERIUM ACEROSUM* (Schränk.), Ehrb.
10. *CLOSTERIUM DIANÆ*, Ehrb.
11. *CLOSTERIUM PARVULUM*, Naeg.
12. *CLOSTERIUM PRONUM*, Delp.
13. *CLOSTERIUM ROSTRATUM*, Ehrb.
14. *CLOSTERIUM SETACEUM*, Ehrb.
15. *DOCIDIUM BACULUM*, D. By.
16. *DOCIDIUM MINUTUM*, Ralfs.
17. *COSMARIUM ACULEATUM*, Wolle.
18. *COSMARIUM AMÆNUM*, Breb.
19. *COSMARIUM BIOCULATUM*, Breb.

20. *COSMARIUM BREBISSEI*, Menegh.
21. *COSMARIUM CONTRACTUM*, Kirch.
22. *COSMARIUM CRENATUM*, Ralfs.
23. *COSMARIUM CUCUMIS*, Corda.
24. *COSMARIUM EXIGUUM*, Arch.
25. *COSMARIUM MARGARITIFERUM*, Menegh.
26. *COSMARIUM MENEGHINII*, Breb.
27. *COSMARIUM MONILIFORME*, Ralfs.
28. *COSMARIUM NITIDULUM*, DeNot.
29. *COSMARIUM ORNATUM*, Ralfs.
30. *COSMARIUM ORTHOSTICUM*, Lund.
31. *COSMARIUM PACHYDERMUM*, Lund.
32. *COSMARIUM PSEUDOTAXICHONDRUM*, Nord.—a form.
33. *COSMARIUM PYRAMIDATUM*, Breb.
34. *COSMARIUM QUADRATUM*, Ralfs.
35. *COSMARIUM RALFSII*, Breb.
36. *COSMARIUM RHOMBUSOIDES*, Wolle, n. sp.
37. *COSMARIUM SUBLOBATUM*, Arch.
38. *COSMARIUM TETRAOPHTHALMUM* (Kg.), Breb.
39. *COSMARIUM TRIPLICATUM*, Wolle—a form.
40. *COSMARIUM TUMIDUM*, Lund.
41. *XANTHIDIUM ANTILOPÆUM* (Breb.), Kg.

42. *XANTHIDIUM CRISTATUM* (Breb.), Ralfs.
43. *XANTHIDIUM FASCICULATUM* (Ehrb.), Ralfs.
44. *ARTHRODESMUS CONVERGENS* (Ehrb.), Ralfs.
45. *ARTHRODESMUS OVALIS*, Wolle.
46. *ARTHRODESMUS SUBULATUS*, Kg.
47. *EUASTRUM BINALE* (Turpin), Ralfs.
48. *EUASTRUM ELEGANS*, Kg.
49. *EUASTRUM INERME*, Lund.
50. *EUASTRUM SIMPLEX*, Wolle.
51. *EUASTRUM SPINOSUM*, Ralfs.
52. *MICRASTERIAS FURCATA* (Kg.), Ralfs.
53. *MICRASTERIAS PINNATIFIDA* (Kg.), Ralfs.
54. *MICRASTERIAS RADIOSA* (Ag.), Ralfs.
55. *STAURASTRUM ALTERNANS*, Breb.
56. *STAURASTRUM ARCTISCON*, Ehrb.
57. *STAURASTRUM ARISTIFERUM*, Ralfs.
58. *STAURASTRUM AVICULA*, Breb.
59. *STAURASTRUM BRASILIENSE*, Nord. Var. *TRIQUETRUM*.
Wolle, n. var.
60. *STAURASTRUM BREVISPIA*, Breb.
61. *STAURASTRUM CRENATUM*, Bailey.
62. *STAURASTRUM CUSPIDATUM*, Breb.

63. STAUSTRUM CYRTOCERUM, Breb.
64. STAUSTRUM DEJECTUM, Breb.
65. STAUSTRUM DICKIEI, Ralfs.
66. STAUSTRUM ECHINATUM, Breb.
67. STAUSTRUM EUSTEPHANUM, Ralfs.
68. STAUSTRUM FURCIGERUM, Breb.
69. STAUSTRUM FUSIFORME, Wolle.
70. STAUSTRUM GRACILE, Ralfs.
71. STAUSTRUM HIRSUTUM (Ehrb.), Breb.
72. STAUSTRUM INCONSPICUUM, Nord.
73. STAUSTRUM LEPTOCLADUM, Nord.
74. STAUSTRUM MARGARITACEUM, Ehrb.
75. STAUSTRUM MUTICUM, Breb.
76. STAUSTRUM PARADOXUM, Meyen.
77. STAUSTRUM SCABRUM, Breb.
78. STAUSTRUM SEBALDI, Reinsch.
79. STAUSTRUM SUBTELIFERUM.
80. STAUSTRUM TRICORNE, Breb.
81. STAUSTRUM TRIFIDUM, Nord.
82. STAUSTRUM XIPHIDIOPHORUM, Wolle.

Most of these are more or less familiar forms, but *Cos-*

marium rhombusoides I consider a new species. The semi-cells are in the form of a rhombus—four-sided—unlike sex-angulare, which has six sides, as its name implies. It is besides a larger plant than the latter.

I was glad to see *Staurastrum xiphidiophorum*, described by me in Bull. Torr. Club, occurring frequently in the vial. It has been hitherto found only in Minnesota, and differs somewhat from the type in not having quite so many spines (daggers).

Staurastrum Brasiliense, Nord. var. *triquetrum*.—This (the typical plant) was originally found in Brazil, and was described as usually four-sided, sometimes five-sided. Your form, although only three-sided, is so like it that I propose to call it var. *triquetrum*.

The ladies to whom we are indebted for these specimens are to be heartily congratulated upon the success of their researches. Never did I see a richer collection of Desmids, and it afforded me much gratification. I have been trying the past ten years to get fresh-water algæ from your State, but always failing, I began to think that California had none, however rich the marine forms might be.

I might have supposed that the forms of Desmids, etc., found on your coast would differ from ours much more than they do, but I was surprised a few days since to observe by a list published in England how like our own those of Japan are.

The following fresh-water algæ, not belonging to the *Desmidiaceæ*, were also found in the vial:

PEDIASTRUM BORYANUM, Turp.

PEDIASTRUM FORCIPATUM, A. Br.

PEDIASTRUM EHRENBORGII, A. Br.

RHAPHIDIUM POLYMORPHUM, Rabh.

MERISMOPEDIA GLAUCA, Nag.

OPHIOCYTIUM CUSPIDATUM, Bailey.

OPHIOCYTIUM COCHLEARE, A. Br.

OPHIOCYTIUM MAJUS, Nag.

ÆDOGONIUM UNDULATUM, A. Br.

ÆDOGONIUM CRYPTOPORUM, Wittr.

NOSTOC—a small form.

CONFERVA. ?

DIATOMS—several species.

LYNGBYA. ?

FUNGI OF THE PACIFIC COAST.

V.

BY H. W. HARKNESS.

RAMULARIA EVONYMI, E. & K.—On living leaves of *Euonymus occidentalis*, Santa Cruz, July, 1884. 3721

RAMULARIA HERACLEI (Oud.), Sacc.—On living leaves of *Heracleum lanatum*, Oakland, September, 1887. 2802

RAMULARIA MENTHICOLA, Sacc.—On living leaves of *Mentha Canadensis*, Folsom, May, 1882. 3210

RAMULARIA MIMULI, E. & K.—On living leaves of *Mimulus luteus*, Folsom, May, 1882. 3215

PHYLLOSTICTA ANGELICÆ, Sacc.—On living leaves of *Angelica Breweri*, Donner, September, 1884. 3394

PHYLLOSTICTA CRUENTA, Fr.—On living leaves of *Smilacina amplexicaulis*, Tamalpais, April, 1882. 3178

SEPTORIA EPILOBII, West.—On living leaves of *Epilobium coloratum*, Folsom, May, 1882. 3218

SEPTORIA DESTRUENS, Desm.—On living leaves of *Sidalcea malvæflora*, Tamalpais, April, 1882. 3176

SEPTORIA ŒNOTHERÆ, B. & C.—On living leaves of *Œnothera ovata*, Piedmont, March, 1882. 3077

SEPTORIA PENTSTEMONIS, E. & E.—On living leaves of *Pentstemon centranthifolius* and *P. corymbosus*, Central California, May—August. 3112, 4151

SEPTORIA RUBI, West.—On living leaves of *Rubus Nutkanus*, Piedmont, June, 1882. 3261

SEPTORIA SCUTELLARIÆ, Thüm.—On living leaves of *Scutellaria tuberosa*, Antioch, April, 1882. 3109

SEPTORIA STACHYDIS, Rob. & Desm.—On living leaves of *Stachys bullata*, San Francisco, February, 1882. 3020

SEPTORIA SYMPHORICARPI, E. & E.—On living leaves of *Symphoricarpus racemosus*, Niles, May, 1882 3248

KELLERMANNIA YUCCÆGENA, E. & E. Jour. Myc. i. 154.—On dead leaves of *Yucca brevifolia*, Mohave Desert, March, 1878. 698

KELLERMANNIA POLYGONI, E. & K., Jour. Myc., ii. 111.—On dead stems of *Polygonum polymorphum*, Blue Cañon, April, 1882. 3277

KELLERMANNIA SISYRINCHII, E. & E., Jour. Myc. ii. 111.—On dead stems of *Sisyrinchium bellum*, Berkeley, February, 1882. 3017

ASCOCHYTA FREMONTIÆ.—Hypophyllous, scattered, minute: spores pale-brown, nearly cylindrical, slightly attenuated at the ends, flexuous, 1-septate, but often appearing 3-septate by division of the endochrome, very unequal in size. μ 6—12 \times 30—40.

Covering the lower surface of living leaves of *Fremontia Californica*, Tehachapi, June, 1884. 3719

DIPLODIA FRANGULÆ, Fekl.—On stems of *Rhamnus Californica*. San Francisco, June, 1881. 2618

DIPLODIA PROFUSA.—On twigs of *Robinia pseudacacia*, Oakland, December, 1882, 2990

DIPLODIA NERII, Spæg.—On dead stems of *Nerium Oleander*, Oakland, February, 1884. 3634

PESTALOZZIA GIBBOSA. — Epiphyllous; acervuli black, erumpent: basidia linear, hyaline, shorter than the spore:

spores elliptic, curved, 4-septate; two lower cells pale brown, the two above them so black that the septum can be seen with difficulty; the apical cell hyaline and crowned by three setæ, with capitate extremities.

Spore $\mu 8 \times 24$; setæ, 40.

On partly dead leaves of *Gaultheria Shallon*, frequently covering nearly the entire leaf, which is blackened by the spores. Point Reyes, June, 1886. 4130

SYNCHITRIUM MYOSOTIDIS, Kühn. — On *Eritrichium*, San Diego, May, 1884. 3598

ÆCIDIUM ABUNDANS, Pk. — On living leaves of *Symphoricarpos racemosus*, and succeeded by *Puccinia Symphoricarpi*, Hk. May, 1884. 3174

ÆCIDIUM PHACELIÆ, Pk. — On living leaves of *Phacelia circinata*, Yo Semite, June, 1883. 3530

ÆCIDIUM RÆSTELIOIDES, E. & E. — On living leaves and stems of *Sidalcea malvaeflora*, Olema, June, 1886. 4123

RÆSTELIA LACERATA, Fr. — On fruit of *Amelanchier alnifolia*, Sierra Nevada, May, 1886. 2723

UREDIO IRIDIS, Schw. — On living leaves of *Iris longipetala* and *I. Douglasii*, San Francisco and Sausalito, June, 1886. 4061, 4095

UREDIO ———? — On living leaves of *Accena pinnatifida*.

This, which is the Uredo form of some *Phragmidium*, is very abundant throughout the summer, but although frequently sought for, teleutospores have not yet been seen.

2648, 2523

TRICHOBASIS HELIANTHELLÆ, Pk. — On living leaves of *Helianthella Californica*, Donner, September, 1882. 3405

UROMYCES EUPHORBIÆ, C. & P., with ÆCIDIUM EUPHORBIÆ; Gmel. — On living leaves of *Euphorbia serpyllifolia*, Central California. 3208, 3491, 4126

UROMYCES PSORALEÆ, Pk.—On living leaves of *Psoralea physodes*, Mt. St. Helena, May, 1884. 3482, 3687

UROMYCES ZYGADENI, Pk.—On *Zygadenus Fremonti*, Tamalpais, July, 1886. 4139

PUCCINIA PIMPINELLÆ, Strauss, with ÆCIDIUM.—On living leaves of *Osmorrhiza nuda*, Sausalito, August, 1881. 2750

PUCCINIA ARTEMISIARUM, Duby.—On *Artemisia Californica* and *A. pycnocephala*, San Francisco, June, 1884. 3463, 2812

PUCCINIA BALSAMORRHIZÆ, Pk.—On living leaves of *Balsamorrhiza deltoidea*, Verdi, August, 1884. 3745

PUCCINIA CLARKIÆ, Pk.—On living leaves of *Clarkia rhomboidea*, Yo Semite, July, 1883. 3592

PUCCINIA PLUMBARIA, Pk., with ÆCIDIUM.—On leaves of *Gilia linearis*, Reno, Nevada, May, 1884. 3348, 3506.

PUCCINIA CONVULVULI, Cast., with ÆCIDIUM CALYSTEGIÆ, Desm.—On living leaves of *Convolvulus luteolus* and *C. villosus*, San Luis Obispo, July, 1885. 4003, 4028

PUCCINIA GRINDELLÆ, Pk., with ÆCIDIUM.—On living leaves of *Grindelia squarrosa*, Williams, Colusa County, May, 1884. 3513

PUCCINIA NIGRESCENS, Pk., with ÆCIDIUM.—On living leaves of *Audibertia incana* and *A. stachyoides*. Reno, Nevada, August, 1882, and Tres Pinos, California, July, 1885. 3365, 4022

PUCCINIA TROXIMONTIS, Pk.—On living leaves of *Troximon heterophyllum*, San Francisco, May, 1883. 3136

PUCCINIA SUBCIRCINATA, E. & E., with ÆCIDIUM.—On living leaves of *Senecio triangularis*, Donner, August, 1883.

3572

PUCCINIA VIOLÆ, DC., with ÆCIDIUM.—On living leaves of *Viola canina*, Cisco, July—August, 1883.

3486, 3544

PUCCINIA WYETHIÆ, Pk.—On living leaves of *Wyethia mollis*, Donner, Sierra Nevada, September, 1882.

3406

PERONOSPORA VITICOLA, B. & C.—On living leaves of *Vitis Californica*, near Bartlett Springs, Lake County, June, 1884, and Russian River, June, 1886.

3706, 4128

This fungus, forming large white patches, is confined to the lower surface of the leaf, where only the stomata from which it emerges is found. The corresponding part of the upper surface is much paler than the healthy portion of the leaf, on which account it is noticeable to a considerable distance. In both the cases noted above it was very abundant, and is a menace to our vineyards not to be lightly regarded.

It was first observed in 1872, in a vineyard near Sacramento, which has since, the vines having been uprooted, been devoted to other uses. The vineyard was near the levee and in close proximity to wild grape vines, from which the fungus was undoubtedly derived.

Dr. Farlow, in Bull. Bussey Inst. i. 422, March, 1876, speaking of this disease of the vine, says:

“One would naturally suppose that a fungus so common as *Peronospora viticola*, which often is found on every leaf of a vine, would have an injurious effect upon the grape crop. Such, however, is not the case. The fungus does not attack the grapes themselves; nor does it, at least in New England, appear until about the first of August; and its withering effect upon the leaves is not very evident before September. As far as out-of-door grape culture in the Northern States is concerned, we are inclined to believe,

that, practically no harm is done by *Peronospora viticola*, but that, on the contrary, the fungus is really beneficial. Our native vines have a luxuriant growth of leaves; and the danger is that, in our short summers, the grapes will not be sufficiently exposed to the sun to ripen. But the *Peronospora* arrives, with us, at a period when the vine has attained its growth for the season; the important point being then to ripen up the grapes which are concealed by the foliage. By shrivelling up the leaves, the *Peronospora* enables the sun to reach the grapes without loss to the vines, as is shown by the fact that the vines continue to live on, year after year, without apparent injury. Should the fungus be introduced into Central Europe, the case might be different. The foliage of *Vitis vinifera* is by no means as luxuriant as that of our own vines; the winters are warmer, the springs earlier, and the summers much moister than here; and it is quite possible that the advent of the *Peronospora*, by reason of the greater warmth and moisture, would be some weeks earlier than here, before the vine had attained its growth, and at a time when the leaves are needed for the work of absorption and assimilation. It might be that the introduction of *Peronospora viticola* into Europe would prove a repetition, on a small scale, of what has, unfortunately, already happened in the case of *Phylloxera*."

It will be seen that Dr. Farlow thinks that *Peronospora viticola* is not likely to prove injurious in the Northern States, but in California the climate and conditions are similar to those of France and Italy, where he justly feared its introduction. It appears with us on the wild vine at the time of flowering and robs it of the leaves necessary to shield the growing grapes from the scorching rays of the sun.

Sulphuring, washes, and all such remedies, used with more or less success in various fungoid diseases of the vine, are necessarily useless in this; for the resting spore, by

which it propagates in the succeeding year, is formed deep in the substance of the leaf, and only becomes free by its decay.

Vineyards in the vicinity of infested wild vines will sooner or later acquire it from them; and the experience of the coffee plantations of Ceylon will be repeated. These became infected by a fungus, probably infrequent on the original host, which propagated itself to such an extent on the more fertile one as almost to ruin the planters.

The only effectual remedy which can be suggested is to destroy by fire the infected vines—taking especial care that no leaves escape; and where a vineyard is to be planted in the vicinity of wild vines, it would be well to destroy the latter as a measure of precaution.

PERONOSPORA OXYBAPHI, E. & K.—On living leaves of *Abronia Crux-Malte*, Reno, Nevada, August, and *A. umbellata*, San Francisco, November, 1882. 3368, 3436

VALSA IMPULSA, C. & P.—On *Pyrus sambucifolia*, Donner, August, 1883. 3551

VALSA FEMORALIS, Pk.—On dead twigs of *Alnus rubra*, Sunol, December, 1881. 2961

VALSA EXIGUA, Nits.—On dead twigs of *Acer macrophyllum*, Sunol, September, 1882. 3385

DIATRYPELLA FROSTII, (Pk.)—On dead branches of *Acer macrophyllum*, Tamalpais, February, 1885. 3907

DIATRYPELLA PROMINENS, Howe.—On dead branches of *Platanus racemosa*, Sunol, January, 1885. 4007

DIATRYPE RHOIS (Schw.)—On dead branches of *Rhus diversiloba*, San Francisco, September, 1885. 4074

DIAPORTHE (TETRASTAGA) ROSTELLATA, (Fr.)—On dead stems of *Rubus Nutkanus*, Cisco, August, 1884. 3782

DIAPORTHE (CHOROSTATE) TESSERA, (Fr.)—On dead twigs of *Corylus rostrata*, San Rafael, March, 1882. 3066

STIGMATEA GERANII, Fr.—On living leaves of *Geranium Carolinianum*, Alameda, April, 1882. 3196

GNOMONIA SETACEA, (Pers.)—On dead leaves of *Corylus rostrata*, Sausalito, January, 1883. 3477

SPHERELLA MOLLERIANA, Thüm.—On living leaves of *Eucalyptus globulus*, San Francisco, December, 1881. 2880

SPHERELLA GAULTHERIÆ, C. & P.—On living leaves of *Gaultheria Shallon*, Lagunitas, November, 1882. 3431

ANTHOSTOMELLA PERFIDIOSA (De Not.)—On dead stems of *Symphoricarpus racemosus*, Sausalito, August, 1881. 2745

SORDARIA LANUGINOSA, Sacc.—On dead branches of *Lupinus arboreus*, San Francisco, June, 1886. 4137

LEPTOSPHERIA ARVENSIS, Sp.—On *Equisetum arvense*, Lake Tahoe, September, 1884. 3766

LOPHIOSTOMA ACERVATUM, Karst.—On dead twigs of *Prunus demissa*, August, 1883. 3555

PLEOSPORA SALSOLÆ, Fekl.—On dead stems of *Salicornia herbacea*, Tamalpais, February, 1885. 3913

PLEOSPORA LEGUMINUM, (Wallr.)—On dead stems of *Hosackia Purshiana*, Mt. Diablo, August, 1884. 3798

PLEOSPORA FRANGULÆ, Fekl.—On twigs of *Rhamnus Californica*, Blue Cañon, June, 1882. 3301

PLEOSPORA OLIGOMERA, Sacc. & Speg.—On dead stems of *Silene Gallica*, San Francisco, 1885. 4089

PLEOSPORA TYPHÆ, Pass.—On dead leaves of *Typha latifolia*, San Francisco, June, 1882. 2986

CUCURBITARIA RIBIS, Niessl.—On dead leaves of *Ribes sanguineum*, Blue Cañon, June, 1882. 3297

THYRIDIDIUM CINGULATUM, (Mont.)—On dead branches of *Symphoricarpus racemosus*, Alta, August, 1884. 3827

MAZZANTIA GALII, (Fr.)—On *Galium aparine*, Sausalito, August, 1881. 2772

PHYLLACHORA EFFUSA, Schw.—On *Helianthus gracilentus*, San Vicente, July, 1885. 4065

PHYLLACHORA PTERIDIS, (Reb.)—On living leaves of *Pteris aquilina*, Blue Cañon, Sierra Nevada, September, 1882. 3398

PHYLLACHORA ? POLEMONII.—Amphigenous; spots black, roundish, 1-3 lines broad, papillate and shining.

Growing on both surfaces of living leaves of *Polemonium humile*, Donner, Sierra Nevada, September, 1882. 3397

This fungus, which is very abundant and showy, has not yet been found mature. A section shows the densely aggregated perithecia involved in the stroma, but no trace of asci.

The high altitude at which it grows (over 7,000 feet) accounts for this fact, as it is covered by the heavy snows of winter before the formation of asci, and the texture of the leaves on which it is found is so thin and fragile that no trace of them can be found the succeeding year.

MONTAGNELLA TUMEFACIENS, Ell. & Hk. Jour. Myc. ii. 41.
Forming gouty swellings which bear considerable resemblance to the "Black Knot," *Dothidea morbosa*, on twigs of *Artemisia Californica*, Mt. Diablo, April, 1882. 3101

TYMPANIS FRANGULÆ, Fr.—On dead stems of *Rhamnus Californica*, Sausalito, February, 1881. 2534

OCCULTATIONS OF STARS BY THE DARK LIMB OF THE MOON

At the Davidson Observatory, San Francisco, Cal.

COMMUNICATED TO THE CALIFORNIA ACADEMY OF SCIENCES, MARCH 1st, 1887,

BY PROF. GEORGE DAVIDSON, A. M., D. Ph.

CLARK EQUATORIAL, 6.4 INCHES.

Date. 1887,	Observer.	Power.	Star.	Magn.	Local Sidereal Times.	Remarks.
Jan. 28..	G. F. D.	90	(? Stone 139).	7	H. M. S. 5 46 41.6	Obsn. good (a)
Feb. 2..	G. D....	90	70 Tauri.....	6	5 49 21.5	" but * ft. ob- jective partly covered. Disapp'nce sharp and sudden
" 2..	G. D....	90	Arg. 15: 630..	8.7	7 50 23.5	
" 2..	G. D....	90	θ' Tauri.....	4	7 50 45.5	" " "
" 2..	G. D....	90	75 Tauri.....	6	7 51 23.4	" " "
" 2..	G. D....	90	Arg. 15: 633..	6.5	7 54 30.2	" " "
" 2..	G. D....	90	Arg. 15: 635..	8.5	8 31 21.7	" " "
" 2..	G. D....	90	B. A. C. 1391.	5	8 46 09.6	" " "
" 2..	G. D....	90	B. A. C. 1394.	7	8 53 38.3	" " "

(a) The identity of this star somewhat doubtful. Transit Observations for time for this, and the observations of February 2d, by G. D.

Observers:—G. F. D.=G. Fauntleroy Davidson.

G. D.=George Davidson.

Geographical Position of Observatory:

Latitude=37° 47' 24."75 N.

Longitude=122° 25' 40."54 W.

ERRATA.

ADDITIONS TO THE ORNITHOLOGY OF GUADALUPE ISLAND.

Page 280, in table. For "385 mm." read "384 mm."

" 283, " " 1691 ♂ read 1691 ♀.

" " " " 1699 ♂ " 1699 ♀.

" " " " 2408 ♂ " 2408 ♀.

" " " " 2504 ♂ " 2504 ♀.

" " " " 2581 ♂ " 2581 ♀.

" " " " 2409 ♂ " 2409 ♀.

" 288, second line. For "form" read "forms."

" 289, second table. For "Scott" read "Scott Mt."

" " " " " "Mar. 20, 1883," read "Mar. 20, 1880."

" 290, eleventh line. For "Guadeloupe" read "Guadalupe."

" 291, fourteenth line. For "Guadaloupe" read "Guadalupe."

" 299, thirteenth line. For "by omitting," substitute "it having omitted."

" 299, eighth line. For "Coue's" read "Coues'."

" 303, second table. For "♀ ad." read "ad."

BULLETIN

OF THE

CALIFORNIA

ACADEMY OF SCIENCES.

Vol. 2, No. 8.

NOVEMBER, 1887.

CONTENTS.

	PAGE.
Discovery of the Nest and Eggs of the Evening Grosbeak. Walter E. Bryant.....	449
A New Subspecies of Petrel from Guadalupe Island. Walter E. Bryant.....	450
Unusual Nesting Sites. Walter E. Bryant.....	451
Some New North American Pselaphidæ. Thos. L. Casey.....	453
Californian Manzanitas. C. C. Parry.....	483
West Coast Pulmonata—Fossil and Living. J. G. Cooper	497
The Flora of the Coast Islands of California, in Relation to Recent Changes in Physical Geography. Joseph Le Conte	515
Priority of Dr. Kellogg's Genus <i>Marah</i> over <i>Megarrhiza</i> Torr. Mary K. Curran.....	521

ISSUED NOVEMBER 2, 1887.

BULLETIN.

No. 8.

California Academy of Sciences.

DISCOVERY OF THE NEST AND EGGS OF THE EVENING GROSBEAK

(*Coccothraustes vespertina*.)

BY WALTER E. BRYANT.

Read June 20, 1887.

Although this species was first described in 1825, I believe that no description of its nest and eggs has previously appeared. Accordingly I take pleasure in announcing the discovery of the first nest and eggs, by Mr. E. H. Fiske, in Yolo County, California. Regarding this interesting finding, Mr. Fiske has written me the following particulars from his field notes.

The nest, containing four eggs, was taken May 10th, 1886, but incubation was so far advanced that he was unable to preserve them. In general shape, color and marking, they were similar to eggs of the Black-headed Grosbeak, but in size he thinks they were somewhat larger.

The nest was built in a small live oak, at a height of ten feet, and was a more pretentious structure than is usually built by the Black-headed Grosbeak, being composed of small twigs supporting a thin layer of fibrous bark, and a lining of horse hair.

It is to be hoped that Mr. Fiske will be successful in finding additional specimens from which measurements may be determined.

DESCRIPTION OF A NEW SUBSPECIES OF PETREL FROM
GUADALUPE ISLAND.

BY WALTER E. BRYANT.

Read July 18, 1887.

A series of fourteen specimens of *Oceanodroma*, collected by myself on Guadalupe Island off Lower California in March, 1886, were assigned to the species *leucorhoa* (Leach's Petrel), in my paper on the ornithology of that island.¹

In a foot note, reference was made to the considerable excess in size of the Guadalupe Island specimens over Leach's Petrel of the Atlantic Coast, but from lack of sufficient material for comparison I was unable to satisfactorily determine their differences, although strongly inclined to consider it a distinct race. My supposition has since been confirmed by several prominent ornithologists, and by comparison with typical specimens of Leach's Petrel from Alaska and coast of Massachusetts, which were kindly loaned from the Smithsonian Institution.

The Alaskan birds seem to be the same size as those from the Atlantic Coast, and of about the same color. A single female from Alaska (No. 102,281 Smithsonian Coll.), is nearly as dark as the Guadalupe birds, but the upper tail coverts are much whiter and the measurements less.

For this well marked local variety, I propose the name

Oceanodroma leucorhoa macrodactyla, subsp. nov.

GUADALUPE PETREL.

Subsp. Char.—Similar to *O. leucorhoa*, but larger and darker.

¹ Additions to the Ornithology of Guadalupe Island. Bulletin California Academy of Sciences, No. 6, pp. 269—318.

White of upper tail coverts more restricted, and the ends of coverts broadly tipped with black. Pileum darker than back, lighter anteriorly. Bill broader and deeper at base than that of *leucorhoa*.

Wing, 155—171 mm.; tail feathers, 85—99 mm.; depth of fork, 23—35 mm.; exposed culmen, 15.5—17 mm.; tarsus, 22—26 mm.; middle toe and claw, 28—30 mm.

Habitat.—Guadalupe Island, Lower California.

Types.—Nos. 2567, ♂ ad.; 2565, ♀ ad. Both in collection of Walter E. Bryant.

UNUSUAL NESTING SITES. I.

BY WALTER E. BRYANT.

Read August 1, 1887.

One of the interesting features of the study of oölogy is the selection of strange nesting sites made by many birds when the circumstances of their environment compel a departure from their customary habits. This is especially noticeable in certain tree-building species, which avail themselves of low bushes and sometimes even the ground in the absence of trees.

During a recent trip to Carson, Nev., and vicinity, I was particularly impressed by the unusual and novel situation which had been chosen by birds whose nesting habits were well known. These had adapted themselves to various situations, the mention of which, together with instances noted from other localities where choice rather than circumstances seemingly prompted the departures, may be interesting.

Callipepla californica.

CALIFORNIA PARTRIDGE.—Essentially a ground building species, but several cases have come to my notice of its nesting in trees upon the upright end of a broken or decayed limb or at the intersection of two large branches. A few years ago a brood was hatched and safely conducted away from a vine-covered trellis at the front door of a popular seminary. How the parent birds managed to get the tender young down to the ground is not known.

Colaptes cafer.

RED-SHAFTED FLICKER.—Three instances are recalled when this species nested in unusual places. One of these was in a bridge bulkhead a few feet above the Carson River. The interior of the structure was filled with gravel and large stones, amongst which the eggs were deposited. Another pair used a target butt at a much frequented range as a substitute for a stump. A third nest was in a sand-bank three feet from the top and ten from the creek. This hole was apparently specially prepared, and not one made by a ground squirrel, such holes being sometimes used by these birds.

Trochilus calliope.

CALLIOPE HUMMINGBIRD.—A nest was found built upon a projecting splinter of a wood pile at a height of five feet. Another was secured to a rope within an outbuilding.

Tyrannus verticalis.

ARKANSAS KINGBIRD.—An old and much flattened nest of Bullock's Oriole was found relined and containing four Kingbird's eggs. One of the most remarkable instances of persistency in nest building was met with in the case of a pair of Kingbirds which had attempted to construct a nest upon the outer end of a windmill fan. A horizontal blade had probably been first selected, but an occasional breath of air had slightly turned the mill, bringing into place an-

other and another, upon each of which had been deposited the first material for a nest until several nests were in different stages of construction, varying with the time that the windmill had remained quiet, while upon the roof below was strewn a quantity of debris that had fallen as the wheel revolved. Of course nothing but failure could be expected from their repeated attempts.

Sayornis saya.

SAY'S PHŒBE.—A nest which could be conveniently reached by a person on horseback was found by Mr. Walter Bliss at Carson, placed within and close to the entrance of a deserted Bank Swallow's burrow.

Scolecophagus cyanocephalus.

BREWER'S BLACKBIRD.—All the nests found at Carson were upon the ground, usually on the edge of a bank formed by an irrigating ditch, with the exception of one which was built two feet from the ground upon dry tule and well hidden by the growing stems.

Carpodacus frontalis rhodocolpus.

CRIMSON HOUSE FINCH.—Besides the odd situations which they select about houses, they avail themselves of the last year's nests of Bullock's Oriole.

Troglodytes aedon parkmanii.

PARKMAN'S WREN.—The species has been known to build in the skull of a horse, which had been placed in a fruit tree; in the nests of Cliff Swallows, and within an old shoe lodged in a tree.

Merula migratoria propinqua.

WESTERN ROBIN.—A pair of Robins built and reared a brood in a hanging basket suspended from the edge of the veranda at the residence of Mr. H. G. Parker at Carson, Nev.

Sialia mexicana.

WESTERN BLUEBIRD.—Dr. Cooper informs me that he has known a Bluebird to build in a Cliff Swallow's nest.

Sialia arctica.

MOUNTAIN BLUEBIRD.—Three incubated eggs of this species were taken from the nest of a Barn Swallow at Lake Tahoe, Cal., by Mr. Walter Bliss.

Passer domesticus.

EUROPEAN SPARROW.—Since the introduction of this pest into our cities, many birds, hitherto common, have left for the suburbs, notably the Cliff Swallows, whose nests were appropriated by the Sparrows. In these cases the limited space compelled the latter to dispense with the usual amount of rubbish, and carry in only a lining of feathers.

ON SOME NEW NORTH AMERICAN PSELAPHIDÆ.

(With Plate XVI.)

BY THOS. L. CASEY.

Read July 18th, 1887.

The Pselaphide fauna of the Pacific coast is by no means so insignificant as it has hitherto been considered, and as the search for these singular and fascinating forms becomes more specialized, and their habits and localities better known, new species are discovered in abundance.

For those who would prosecute a more extended collection of these insects, it may be stated that the Californian Pselaphidæ are very seldom found with ants, although a few myrmecophilous species are known, but generally in fungous earth, about the roots of trees, under bark, or in the long wet moss covering the rocks in the secluded ravines of mountainous regions. The genus *Oropus*, and several species of *Reichenbachia* and *Batrissus* are peculiar to the last-named localities, while *Euplectus* and *Pytna* are always found under bark. *Sonoma* and *Actium* are sometimes found under bark, but often also in fungous earth. *Batrissus zephyrinus*, on the other hand, I found in abundance at Lake Tahoe, living in the most indiscriminate localities—under bark, under chips buried in grassy turf, and in fungous earth.

The following forms, most of which were collected by myself, and which have been accumulating in my cabinet during the past two years, are here described as new, although it is possible that *Actium californicum* Lec., may be redescribed under that genus. This can only be the case, however, under the supposition that the description given by LeConte for that species is erroneous in regard to the

length of the elytral striæ, and as the species of this genus are numerous and rather local, the probabilities are decidedly against the formation of a synonym.

<i>Biotus formicarius</i> n. gen.	<i>Tychus bipuncticeps</i> .
<i>Pytna corticina</i> n. gen.	<i>Actium pallidum</i> .
<i>Batrisus cephalotes</i> .	<i>politum</i> .
<i>luculentus</i> .	<i>robustulum</i> .
<i>foveicornis</i> .	<i>testaceum</i> .
<i>punctifrons</i> .	<i>Euplectus californicus</i> .
<i>Decarthron Brendeli</i> .	<i>Rhexidius granulosus</i> n. gen.
<i>Bryaxis arizonæ</i> .	<i>Oropus montanus</i> .
<i>Nisaxis cincinnata</i> .	<i>Sonoma corticina</i> .
<i>maritima</i> .	<i>cavifrons</i>
<i>Tychus sonomæ</i>	

BIOTUS n. gen. (*Ctenistides*.)

Clypeus simple. Body covered densely with very minute, recumbent setæ. Antennæ elongate, cylindrical, outer joints not enlarged, second joint smallest. Head with two spongiose foveæ; frontal tubercle divided, the canaliculation extending slightly along the front. Prothorax transverse, with longer, more erect and denser pubescence, trifoveate at base, the foveæ large, spongiose, not connected. Elytra with deeply impressed sutural and one long discal stria. Abdomen without ridges; second visible dorsal longer than the first. Posterior coxæ separated. Trochanters normal.

The maxillary palpi are very short, robust and compact; the second joint is somewhat slender, but short; the last two are transverse, anchylosed, forming a circular club which is affixed obliquely to the second joint. No basal joint is visible, and the palpi may possibly be three-jointed. The genus should be placed near *Ceophyllus* Lec. from which it differs in the remarkably minute and singular palpi. It may be easily identified by its non-clavate antennæ with the second joint small.

B. formicarius n. sp.—Rather robust, pale testaceo-ferruginous throughout; integuments shining; pubescence dense, rather long and erect on the head and prothorax, very short and recumbent on the elytra and abdomen; not perceptibly punctate. *Head* not much depressed, slightly longer than wide; clypeus rounded, conical; labrum very short, strongly transverse;

eyes large, coarsely granulate, convex, prominent, at less than their own length from the base; the latter broadly arcuate; occiput having, on a line through the middle of the eyes, two large, feebly impressed, spongiöse foveæ, mutually scarcely more distant than either from the eye; antennæ nearly one-half as long as the body, joints two to ten transverse, cylindrical, first joint flattened, about as long as wide, second small, eleventh slightly longer than the two preceding together. *Prothorax* distinctly wider than the head, widest in the middle; sides rather broadly rounded, almost straight near the apex and base; the latter transverse, abruptly arcuate in the middle third, one-third wider than the apex and but slightly narrower than the disk; apex broadly, very feebly emarginate; posterior angles slightly rounded; disk one-half wider than long, moderately convex, feebly tuberculate in the middle anteriorly; median fovea feebly impressed, elongate, elliptical, beginning at the middle and continuing nearly to the basal margin; lateral foveæ smaller, circular, deeply impressed, at one-third the length from the base. *Elytra* at base as wide as the base of the prothorax, at apex three-fourths wider; humeri but slightly prominent; sides evenly arcuate; together very slightly wider than long, each with two large basal foveæ; sutural stria coarse, deep, nearly straight, approaching the suture toward apex; discal coarse, deep, slightly arcuate, continuing for about three-fourths the length. *Abdomen* slightly narrower than the elytra, about equal in length to the latter; sides nearly parallel, feebly arcuate; border strong, diminishing in width; surface broadly convex. *Legs* rather long and slender, alutaceous, very densely clothed with minute recumbent setæ; middle trochanters very slender; tarsi rather short; claws small, equal. *Metasternum* impressed in the middle, more strongly so posteriorly. Length 2.8 mm.

California (Los Angeles 2.)

The four outer joints of the antennæ are more finely and densely pubescent and slightly paler in color, the eighth joint two-thirds wider than long, much shorter than the ninth or tenth, the latter nearly equal.

This interesting species lives in the nests of a small pale brown ant.

PYTNA n. gen. (Tyrides.)

The present genus has the pubescence fine and subrecumbent and not short, robust and recumbent as in the *Ctenistides*; following the classification suggested by Reitter, it should therefore be placed in the group indicated.

Antennæ approximate; club gradual, three-jointed. Maxillary palpi four-jointed; basal joint minute; second long, clavate, bent; third shorter, ob-

conoidal, as robust as the second; third one-half longer than the second, fusiform, equal in thickness to the second, acuminate at apex, having a slender terminal process. Head with three small spongiose foveæ at the apices of an equilateral triangle; eyes large, convex, rather coarsely granulate; clypeus angulate at the sides. Pronotum with three small basal foveæ connected by a fine impressed line. Elytra each with one sutural and one discal stria. Abdominal border wide, nearly flat; first visible segment with a median basal carina; first two segments equal in length. Prosternum excavated in front of the coxæ; legs rather long; femora slightly robust, the anterior with a short longitudinal carina beneath and near the base; middle tibiæ strongly arcuate; tarsi long and slender, three-jointed; basal joint very small; second and third elongate, the latter the longer; claws simple, moderate in length, equal, slender; anterior trochanters with a small posterior tuberculate tooth; intermediate with a long corneous process, projecting posteriorly from the apex obliquely outward; middle coxæ narrowly, posterior rather widely separated.

The modifications of the trochanters and the inferior carina of the anterior femora are not sexual characters, but are nearly as well developed in the female as in the male. *Pytna* appears to belong in the neighborhood of *Tyrus*, but differs in the structure of the palpi.

P. corticina, n. sp.—Bright rufous, abdomen piceous; integuments polished; pubescence fine, rather short, moderately dense. *Head* very slightly longer than wide, nearly flat above; eyes large, at more than their own length from the base; genæ convergent, feebly arcuate to the neck, clothed with longer, more conspicuous pubescence; foveæ small, the two posterior slightly behind the middle; antennal tubercle slightly transverse, feebly canaliculate in the middle; antennæ long and slender, distinctly more than one-half as long as the body, basal joint subcylindrical, much longer than wide, second slightly narrower, as long as wide, very feebly obconical, three to six subequal, very slightly shorter and narrower than the second, nearly as long as wide, seventh and eighth very slightly smaller, equal, ninth as long as the two preceding together, feebly obconical, one-half longer than wide, tenth as long as the ninth, slightly thicker, feebly obconical, eleventh ovoidal, acuminate, one-half wider than and nearly twice as long as the tenth. *Prothorax* widest at one-third the length from the apex; sides distinctly convergent and nearly straight to the apex; very feebly convergent and just visibly sinuate to the base; the latter broadly and rather strongly arcuate, scarcely perceptibly narrower than the disk, one-half wider than the apex; the latter transversely truncate; surface convex, impunctate, except near the base; transverse line fine, parallel to the basal margin and distant from it by one-fifth the length; foveæ very small; disk slightly longer than wide, very

slightly wider than the head. *Elytra* one-third longer than the prothorax, at apex more than twice as wide as the latter; sides strongly divergent, strongly arcuate; humeri rounded, slightly tumid; disk much wider than long, feebly convex, coarsely but not very densely punctate, truncate behind, the edge densely fimbriate; sutural striæ deep, straight, beginning distinctly before the basal margin; discal arcuate, fine, terminating at nearly one-third the length from the apex, broadly dilated and deeply impressed toward base. *Abdomen* fully as wide but scarcely as long as the elytra; sides parallel, strongly arcuate; border wide; surface impunctate, strongly convex; basal carina strong. Length 2.0–2.2 mm.

California (Lake Tahoe 11).

The description is drawn from the male, the sexual modification consisting of a very feeble impression in the middle of the abdomen near the base, and a small deep emargination at the apex of the terminal segment. The female differs but slightly, the terminal segment of the abdomen being broadly angulate at apex.

This species was taken rather abundantly under the bark of various fallen conifers.

BATRISUS Aubé.

B. cephalotes n. sp.—Somewhat robust, very convex, piceous; legs and antennæ pale rufo-ferruginous throughout; pubescence long, coarse, erect, sparse, much denser on the head behind and beneath the eyes, short on the vertex; integuments polished.

Male—*Head* very large, distinctly wider than long and wider than the prothorax; surface feebly convex; apex very broadly and evenly arcuate throughout the width between the very widely distant antennæ; sides parallel; eyes very small, on the sides just behind the middle, convex, prominent; foveæ round, moderate in size, spongiose, at one-third the length from the base, mutually twice as distant as either from the eye; connecting channel feebly impressed, becoming obsolete anteriorly near the edge of the frontal declivity; vertex abruptly declivous between the antennæ, having in the middle of the lower edge two very approximate teeth, each of which has a deep setigerous puncture on the upper surface near the outer edge; laterally the lower edge is setigerous; vertex beneath the dentiferous edge very deeply excavated throughout the width between the bases of the antennæ; clypeus angulate at the sides, with the edges reflexed, more strongly so at apex which is transversely sinuate; portion before the reflexed apex in the form of a large setigerous tubercle which is further advanced than the two teeth of the upper surface; labrum broadly sinuate, anterior angles promi-

ment; antennæ robust, as long as the head and prothorax together, club very large, basal joint large, one-half longer than wide, as long as the next two together, lower surface simple but more strongly convex than the upper, second slightly longer and more robust than the third, joints three to eight equal in width, ninth wider, transverse, tenth much wider than the ninth, very slightly wider than long, subglobular, eleventh wider than the tenth, conoidal, apices of joints six to nine slightly oblique; upper surface very coarsely, feebly and sparsely punctate at the sides near the antennæ, elsewhere impunctate, not carinate. *Prothorax* as long as wide, widest just before the middle, where the sides are strongly rounded and rather prominent, being abruptly and strongly sinuate and rather strongly convergent to the base, broadly rounded to the apex; base scarcely one-fifth wider than the apex, three-fourths as wide as the disk; the latter trisulcate; middle sulcus narrow, deep, obsolete at one-fifth the length from the apex; having near the base a very deep, round, nude median fovea, and two large, spongiose, lateral foveæ, between them bispinose with a longitudinal ridge proceeding anteriorly from each spine, also tuberculate on each lateral edge near the base; surface near the basal margin bifoveate laterally, obsoletely and very finely carinate in the middle. *Elytra* very sparsely, rather coarsely and feebly punctate, each trifoveate at base; discal striæ short, broadly, feebly impressed; humeri minutely and distinctly spinose. *Abdomen* with two short cusps at base. *Legs* rather long; femora robust; posterior tibiæ with terminal process. Length 2.0 mm.

New York 1 (Mr. Henry Ulke.)

Belongs near *denticollis*, from which it is easily distinguished by the form of the bidentate vertex, this being declivous, with the teeth upon the lower edge in the present species, and broadly emarginate, with the teeth porrected and but very little below the level of the front in *denticollis*.*

B. luculentus n. sp.—Rather slender, polished, piceous; elytra slightly paler and more rufous; legs pale; antennæ dark rufous, club paler; pubescence rather sparse.

Male.—*Head* rather large, wider than long, wider than the prothorax, very feebly convex, coarsely, sparsely and feebly punctate anteriorly, impunctate posteriorly; eyes moderate, convex, prominent, near the base; foveæ deep, round, nude, at two-fifths the length from the base, mutually distinctly more than twice as distant as either from the eye; arcuate groove fine, deeply

* NOTE.—From material recently sent me for identification by Dr. Emil Brendel, I find that this species is widely diffused through the North Atlantic districts, there being specimens in the series indicated from New York and Illinois.

impressed near the foveæ, becoming completely obsolete anteriorly; vertex gradually declivous between the antennæ the declivity broadly biimpressed, the impressions setigerous; lower edge bidentate in the middle, the teeth slightly reflexed and with many erect setæ on the lower surface, deeply excavated beneath between the antennæ; clypeus broadly arcuate anteriorly, sides feebly divergent posteriorly and nearly straight, angles slightly rounded, not prominent, surface conical, edge not at all reflexed, having in the middle an abrupt, small, strongly elevated tubercle at a considerable distance from the anterior margin and rising just before the two superior teeth, exceedingly minutely and sparsely setose; labrum broadly emarginate, angles prominent; antennæ slightly longer than the head and prothorax together, moderately robust, very strongly clavate, basal joint more convex beneath, not otherwise modified, as long as the next two together, second longer and more robust than the third, eighth shortest, strongly transverse, ninth slightly longer and nearly one-half wider than the eighth, transverse, tenth large, nearly twice as wide as the ninth and very nearly as long as wide, sides parallel, arcuate; eleventh distinctly narrower than the tenth, acuminate. *Prothorax* slightly longer than wide; dorsal ridges and median sulcus almost completely obsolete; median basal puncture small, round, nude, impressed; lateral slightly larger, spongiose; lateral sulcations broadly impressed, feeble; lateral basal tubercles minute; surface near the basal margin bifoveate at the sides, not at all carinate in the middle; disk convex, widest before the middle; sides rather broadly rounded, feebly sinuate toward base and apex; base slightly more than three-fourths as wide as the disk, one-fourth wider than the apex. *Elytra* fully as long as wide, convex; humeri slightly prominent but not at all spinose. *Abdomen* with two long, parallel, prominent cusps at base, distant by one-fifth the abdominal width. *Legs* rather long; femora moderately robust; middle tibiæ with an internal apical spur; posterior feebly arcuate, with a terminal process. Length 1.7 mm.

District of Columbia 2 (Mr. Henry Ulke).

The female has the vertex strongly declivous, and thence less strongly and continuously so over the surface of the clypeus, which is finely, strongly and densely granulose; the vertex is not excavated between the bases of the antennæ, each of which is inserted in a large lateral excavation. The antennæ are more slender, with the outer joints gradually wider, the tenth transverse and but slightly larger than the ninth.

This species should also be placed near *denticollis*; these three species belong to the *nigricans* group; the latter is, however, distinguished by the unusual structure of the

antennæ, the third joint of which is, according to the description of Dr. Le Conte, presumably more robust than the second.

B. foveicornis n. sp.—Rather slender, convex, rufous throughout; integuments polished, impunctate; pubescence rather long, coarse and sparse.

Male—*Head* moderate, slightly longer than wide, very slightly wider than the prothorax; vertex between the antennæ coarsely, feebly and not densely punctate, punctures asperate, elsewhere impunctate; eyes small, very convex, prominent, rather finely granulate; base behind them broadly arcuate; surface very feebly convex, very feebly and finely carinate in the middle near the base, finely and distinctly carinate at each side above the eyes; arcuate groove broadly impressed, extending from the base at the sides to the vertex, where it becomes very feeble; foveæ small, nude, very deep, perforate, situated at less than one-third the length of the superior portions from the base, and on the inner margin of the arcuate impression; vertex declivous and slightly produced in the middle, being separated from the clypeus by a narrow, feebly impressed transverse groove; clypeus large, prominent, conical, strongly rounded anteriorly, very obtusely angulated at the sides, edges not at all reflexed; antennæ rather slender, as long as the head and prothorax together, basal joint subcylindrical, not modified, nearly as long as the next two together, two to seven subequal, distinctly longer than wide, the second slightly more robust and the sixth a very little shorter, eighth equal in width, distinctly wider than long, ninth equal in length to the eighth, one-third wider, inner side much more strongly convergent toward apex, tenth abruptly very large, nearly twice as wide as the ninth, fully as long as wide, flattened, sides parallel, almost straight, eleventh as wide as the tenth, as long as the three preceding together, obliquely acuminate, very slightly flattened on the lower side. *Prothorax* widest slightly before the middle; sides strongly rounded, convergent and feebly sinuate toward base and apex; median and lateral foveæ almost equal, deep, at nearly equal distances from the base, the median nude; median groove short, feebly impressed, lateral more distinct; basal spines small; ridges distinct, becoming obsolete before the middle, separated behind from the spines by transversely arcuate impressions; base bifoveate at each side; disk strongly convex, very slightly longer than wide, base much wider than the apex. *Elytra* fully as long as wide, nearly twice as wide as the prothorax, very convex; humeri prominent, not spinose. *Abdomen* nearly as wide and as long as the elytra; basal cusps rather long, strong, separated by scarcely one-sixth the abdominal width. *Legs* long, slender; anterior trochanters minutely toothed posteriorly; posterior tibiæ with an apical process; tarsi very long and slender, the posterior one-half as long as the tibiæ. Length 1.9 mm.

Tennessee 2 (Mr. Henry Ulke).

The large flattened tenth antennal joint has, on the lower surface and near the base, a very large deep circular perforate fovea. Of the species in which the tenth antennal joint is enlarged in the males, there are some—for example *cephalotes*—in which this joint, although unusually large and prominent, is almost completely unmodified upon the lower surface, others — *virginie*, *denticollis*, etc. — which have the lower surface slightly flattened and with a small, deep fovea near the base; but in no case which has come under my observation is this fovea one-half so large, or the joint itself so strongly flattened as in the present species.

The two specimens indicated are males. The species probably belongs near *spretus* Lec., which is described as black.

B. punctifrons n. sp.—Moderately robust, convex, piceous-black; elytra very slightly paler, rufo-piceous; legs and antennæ pale rufo-ferruginous, the latter slightly darker toward base; integuments polished, impunctate; pubescence rather long, sparse, flavate.

Male.—*Head* moderate, slightly longer than wide, just visibly wider than the prothorax; eyes moderate, convex, at their own length from the base; genæ strongly convergent, feebly arcuate; base broadly sinuate; surface feebly convex, very finely, feebly, arcuately carinate above the eyes; impressed groove continuous from the base at the sides to the vertex, at which point it is but slightly more feeble; foveæ deep, nude, in the middle of the groove; vertex coarsely, sparsely and feebly punctate on the antennal tuberculations, which are large and flat, declivous anteriorly, the declivity moderate, beginning along a straight line between the antennæ; apex strongly rounded; declivous surface very strongly, finely and densely punctate, each puncture bearing a very minute, coarse, flavate seta; apex divided from the clypeus by a fine, transverse, strongly arcuate, deeply impressed groove; clypeus short, broadly subangulate, obtusely angulate at the sides; surface finely scabrous, conical; edges not at all reflexed; having in the middle a small, feeble tubercle which bears a tuft of rather long, erect, flavate setæ; antennæ rather long, slender, one-fourth longer than the head and prothorax together, club strong, basal joint not modified, cylindrical, shorter than the next two together, second much longer and distinctly more robust than the third, joints two to seven longer than wide, eighth equal in width, nearly as long as wide, ninth wider and longer, tenth similar to the ninth, distinctly wider and longer, slightly wider than long, inner side much shorter than the outer, eleventh large, twice as wide as the tenth, ovoidal, acuminate, nearly as long as the four preceding together. *Prothorax* slightly longer

than wide, widest slightly before the middle; base two-thirds as wide as the disk, one-fourth wider than the apex; median sulcation feebly impressed, becoming obsolete at one-third the length from the apex; spines moderate; ridges almost obsolete; lateral grooves broadly, feebly impressed; foveæ large and deep. *Elytra* fully as long as wide; humeri prominent, not spinose. *Abdomen* nearly as wide as, but much shorter than the elytra; basal cusps fine, strong, rather long, parallel, separated by one-fifth the abdominal width. *Legs* long, slender; posterior tibiæ with apical process. Length 1.8 mm.

Pennsylvania 1 (Mr. Henry Ulke.)

This species is very distinct in the characters of the vertex and antennæ; the eleventh joint is here more than usually developed, while the tenth is but slightly larger than the ninth and of nearly the same form.

DECARTHON Brend.

D. Brendeli n. sp. — Form somewhat robust, convex, piceo-castaneous throughout; legs and antennæ paler, rufous; pubescence rather long and sparse, more dense on the abdomen and at the sides of the prothorax and head; integuments polished. *Head* moderate, as wide as long, very feebly convex, almost impunctate; eyes large, coarsely granulated, convex and prominent; genæ extremely short behind them; base wide, transversely truncate; on a line through the anterior portions of the eyes there are two widely distant nude foveæ; antennal tuberculations large, distinctly elevated; antennæ as long as the head and prothorax together, rather slender, club rather large, basal joint cylindrical, slightly longer than wide, second slightly shorter and narrower, third feebly obconical, as long as and much narrower than the second, four to six subequal, very slightly longer than wide, and just visibly wider than the third, seven larger, scarcely as long as wide, eight very short, transverse, narrower than the seventh, ninth much wider than the seventh, very feebly trapezoidal, nearly twice as wide as long, tenth very slightly wider than the ninth, ovoidal, pointed, nearly as long as the three preceding together. *Prothorax* scarcely as wide as the head, very slightly wider than long; sides broadly rounded, convergent and feebly sinuate toward base; the latter broadly arcuate, four-fifths as wide as the disk, one-half wider than the apex; disk strongly, evenly convex, not impressed at the sides, having a deep nude fovea in the middle near the base. *Elytra* near the apex fully twice as wide as the prothorax; sides strongly divergent, arcuate; disk wider than long, two-thirds longer than the prothorax, convex, coarsely and extremely feebly punctate; sutural striæ deep, feebly arcuate; discal deeply impressed, feebly arcuate, parallel to the suture, terminating at nearly two-fifths the length from the apex. *Abdomen*

two-thirds as long as the elytra, nearly as wide as the latter; first segment, when viewed vertically, occupying three-fourths of the entire length, feebly convex; border narrow, flat; basal carinæ strong, very feebly divergent, slightly more than one-half as long as the segment, separated by one-half the entire width. *Legs* rather long and slender. Length 1.3-1.5 mm.

Texas (Galveston 8).

The above described type is a male. In this sex the middle femora are very singularly modified, being very strongly swollen, abruptly constricted near the apex, impressed anteriorly, with an anterior tooth near the apex and just before the deep apical constriction. In the female the femora are all simple and rather slender, and the seventh antennal joint is smaller than the eighth. The female is, in addition, smaller than the male, and has the dorsal carinæ of the abdomen distinctly shorter.

I have dedicated this very distinct species to a friend, the author of the genus, and one to whom our systematic knowledge of the American representatives of the family is greatly indebted.

BRYAXIS Leach.

B. arizonæ n. sp.—Form rather slender, pale testaceous throughout; shining, not distinctly punctate; pubescence very fine, short and rather sparse. *Head* moderate, triangular; eyes large, prominent; occipital foveæ on a line just before the middle of the eyes, mutually more than twice as distant as either from the eye; apical fovea equal to the occipital, slightly less distant from either of the others than the mutual distance of the latter; connecting channel almost obsolete; antennæ slender, slightly longer than the head and prothorax together, joints three and five each nearly twice as long as wide, distinctly longer than the fourth and equal in length to the second, the latter more robust, seventh distinctly shorter than the sixth, slightly longer than wide, eighth, ninth and tenth distinctly wider than long, increasing uniformly and very rapidly in size, eleventh wider than the tenth, much longer than wide, obliquely acuminate. *Prothorax* widest at the middle; sides rounded anteriorly, rather deeply sinuate posteriorly; base broadly, very feebly arcuate, five-sixths as wide as the disk, nearly one-half wider than the apex; the latter very feebly arcuate; disk distinctly wider than long, equal in width to the head, convex; middle fovea slightly smaller than the lateral, the former at one-fifth, the latter at nearly one-third the length from the base. *Elytra* at the humeri very slightly wider than the prothorax, at

the apex slightly less than twice as wide as the latter; disk distinctly wider than long, moderately convex; sutural striæ strong, nearly straight, convergent and arcuate near the apex; discal fine, feebly impressed, feebly sigmoid, becoming obsolete at one-fifth the length from the apex. *Abdomen* slightly shorter and very little narrower than the elytra; sides nearly straight and parallel; border moderate in width; surface broadly and feebly convex; first segment, the only one seen when viewed vertically, nearly five-sixths as long as the elytra. *Legs* slender. Length 1.2 mm.

Arizona (Tucson 1).

Described from the male, the sexual characters being similar in form to those of *texana*, but having the median tubercle of the second segment smaller, less transverse and much more prominent.

This species belongs to the *texana* group of the genus, which is distinguished by the great development of the first ventral segment in the male, this being the only part of the abdomen seen when viewed vertically. It differs from *texana* in its smaller size, slightly more robust form, much shorter elytra, narrower abdominal border, in the size and position of the pronotal foveæ, and in its shorter antennæ with less prominent club; the eighth, ninth and tenth joints in *texana* are much less transverse. In *texana* the median fovea of the pronotum is larger, and at about one-fourth the length from the base, the three foveæ being more nearly on a transverse line than in *arizonæ*.

NISAXIS Casey.

N. cinnamata n. sp.—Slightly robust, clear testaceous throughout; legs and antennæ slightly paler; pubescence moderately dense, rather long. *Head* very slightly narrower than the prothorax, as long as wide; eyes rather large, prominent, at two-thirds their own length from the base; genæ very feebly convergent toward base, feebly arcuate, not at all prominent; base transversely truncate; front large, quadrate, feebly convex, coarsely, deeply, not densely punctate, impunctate in the middle, feebly biimpressed near the vertex; antennæ about as long as the head and prothorax together. first two joints nearly equal, slightly more robust, one-half longer than wide, nearly cylindrical, third obconical, longer than wide, much shorter than the second, as long as the fifth, longer than the fourth, sixth and seventh slightly shorter, very little longer than wide, eighth very slightly wider, a little wider than

long, shorter than the seventh, ninth two-thirds wider than the eighth, obtrapezoidal, outer side more oblique, tenth one-half longer and wider than the ninth, one-half wider than long, eleventh distinctly wider than the tenth, as long as the three preceding together, longer than wide, obliquely acuminate. *Prothorax* widest at two-fifths the length from the apex; sides strongly rounded, feebly incurvate toward base; the latter broadly, evenly arcuate, three-fourths as wide as the disk, nearly two-thirds wider than the apex; disk one-third wider than long, evenly convex, rather coarsely, extremely feebly and not densely punctate; having in the middle, at one-fifth the length from the base, a small nude punctiform fovea, and, at each side, a larger feebly impressed nude fovea at one-third the length from the base. *Elytra* at the humeri distinctly wider than the prothorax, together distinctly wider than long, one-half longer than the pronotum, and, at apex four-fifths wider than the latter; disk moderately convex, sutural stria deeply impressed, evenly, feebly arcuate; discal fine, distinct, extending very slightly beyond the middle; sutural foveæ very small and at the extreme basal margin; lateral larger and further from the base; base otherwise devoid of foveæ; surface very minutely, feebly and sparsely punctate. *Abdomen* two-thirds as long as the elytra, nearly equal in width, occupied for six-sevenths the entire length when viewed vertically by the basal segment; border rather narrow, flat; surface moderately convex, finely, feebly and sparsely punctate; basal carinæ divergent, straight, strong, nearly one-half as long as the segment, separated by one-half the abdominal width. *Legs* rather long and slender; posterior tibiæ abruptly bent near the apex, middle coxæ large, globose, not prominent, distinctly but narrowly separated by the sternal processes which are truncate and not carinate; posterior small, widely separated. Length 1.1 mm.

Texas (Galveston 10).

Described from the male in which the first two dorsals are simple, the third transversely and feebly impressed, the impression large and anteriorly lunate, the inclosed apical elevation being feebly convex and bearing a loose tuft of long erect setæ; fourth and fifth normal, broadly arcuate at apex, the latter short and with the posterior margin very feebly produced in the middle. Viewed from beneath the abdomen consists of three visible segments, although there is probably a fourth which is completely hidden under the third; the basal segment is very long, and, in the middle, occupies the entire extent, except a very small apical portion where the two short posterior segments become very short, the third being at this point deflexed and channeled

externally. Besides the tuft of long setæ from the median elevation of the third segment, there are many long conspicuous setæ on the second, and at the sides and base of the third.

N. maritima n. sp.—Form somewhat slender, dark rufous throughout; elytral apices slightly darker; legs and antennæ very slightly paler; pubescence long, rather coarse, not dense. *Head* slightly narrower than the prothorax, nearly as wide as long; eyes moderate, at nearly their own length from the base; genæ feebly arcuate, not at all prominent, as long as the eye; front feebly convex, feebly, finely and sparsely punctate toward the eyes, impunctate in the middle; antennæ slender, about as long as the head and prothorax together, nearly as in *cincinnata*, ninth joint symmetrical, but slightly wider than long, tenth strongly transverse, truncate at base and apex, nearly cylindrical, eleventh elongate, but slightly wider than the tenth. *Prothorax* one-fourth wider than long, widest before the middle; sides strongly rounded, strongly sinuate near the basal angles; base broadly arcuate, nearly four-fifths as wide as the disk, one-half wider than the apex; surface very minutely, feebly and sparsely punctate; basal fovea very small, at one-fifth the length from the base; lateral moderately deep, larger, at one-fourth the length from the base. *Elytra* slightly wider than long, at apex four-fifths wider than the prothorax; sides feebly divergent; disk rather strongly convex; sutural striæ strong, feebly arcuate; discal fine, distinct, extending from near the base for two-thirds the length. *Abdomen* but slightly more than one-half as long as the elytra; border rather narrow; basal carinæ short, one-fifth as long as the basal segment, divergent, feeble, separated by slightly more than one-half the abdominal width. *Legs* long and slender; posterior tibiæ bent near the apex. Length 1.0 mm.

Texas (Galveston 3.)

The description is taken from the male, the sexual characters being very remarkable. The first dorsal segment occupies nearly the entire extent of the abdomen when viewed vertically, and has the apex abruptly deflexed in the middle, the deflexed portion being transversely impressed or excavated; its lower margin is reflexed and broken into two lateral crests and a small median and strongly elevated tubercle; the edge of the segment immediately above the deflexed excavated portion is more densely setose and bears two feeble tubercles. The second segment is short, transversely and very deeply excavated in the middle third, the

excavation being anteriorly arcuate and extending under the apical process of the first; at the apex there is in the middle a strongly elevated carinate tubercle which is slightly transverse, with the apex directed anteriorly for a slight distance over the excavation, and bearing two fine setiform appendages; its posterior surface is feebly and minutely tuberculate; the surface of the segment has, at each side of the central excavation, a transverse arcuate canaliculation which is disconnected. The third segment has, just before the middle, two small tubercles distant by nearly one-half the width, the remainder of the surface being unmodified. Fourth segment unmodified. Fifth shorter, feebly produced in the middle.

The under surface, as in *cincinnata*, consists of but three visible segments, the first being very long, the third abruptly and narrowly deflexed in the middle, the deflexed portion being channeled externally. There is, however, a fourth segment to be seen by looking longitudinally under the third, by which it is entirely covered. The surface of this fourth segment is abruptly arched at each side between the middle and the lateral edges, the arching being visible as a semicircular emargination of the edge when viewed longitudinally, and there is on the edge in the middle a strong vertical spine which appears to fit into the channel in the deflexed apex of the third segment.

These species belong near *tomentosa* Aubé, but appear to be smaller and more sparsely pubescent. The genus is almost exclusively confined to the sea-beaches of the Atlantic coast.

TYCHUS Leach.

T. sonomæ n. sp.—Slender, convex, piceous; elytra, legs and antennæ testaceous; pubescence fine, moderate in length, sparse; integuments polished, impunctate. *Head* much narrower than the prothorax, distinctly longer than wide, broadly rounded behind the eyes; the latter rather large, prominent, coarsely granulate, at nearly their own length from the base; surface transversely convex, transversely impressed behind the frontal

tubercle, which is transverse, convex and impressed along the middle; on a transverse line passing through the anterior portion of the eyes there are two minute, widely distant, punctiform foveæ; antennæ slightly longer than the head and prothorax together, robust, strongly clavate, basal joint much longer than wide, arcuate, second slightly narrower, quadrate, third narrower, obconical, longer than wide, joints three to seven subequal, eighth very slightly wider than long, ninth abruptly much wider, tenth still wider, equal in length, ninth and tenth distinctly wider than long, eleventh wider than the tenth, as long as the three preceding together, acuminate. *Prothorax* widest slightly before the middle, as wide as long, strongly convex; sides rather strongly rounded, feebly sinuate near the apex, more strongly so near the base; the latter broadly arcuate, four-fifths as wide as the disk, one-third wider than the apex; basal fovea minute, very near the margin; lateral impressions feeble; along the basal margin between the median fovea and the basal angles there are, on each side, two small punctiform foveæ, nearly as large as the median. *Elytra* at the humeri scarcely perceptibly wider than the prothorax, at the apex nearly twice as wide as the latter; sides evenly arcuate, together transversely truncate behind, convex, as long as wide, two-thirds longer than the prothorax; each bifoveate at base; sutural stria deeply impressed; discal distinct, broadly impressed, terminating slightly before the middle. *Abdomen* two-thirds as long as the elytra, much narrower than the latter, parabolic in form; basal segment much longer than the second; lateral border narrow, flat, rapidly attenuate from base to apex. *Legs* rather long and slender; posterior tibiæ arcuate toward apex. Length 1.25 mm.

California (Mendocino Co., 1.)

The specimen described is probably a male; the sexual characters are very feeble, the fifth segment being longer, feebly flattened, and broadly bilobed at apex. The species is much smaller than either of the two previously described from these regions, and the fourth joint of the maxillary palpi has a long and distinct terminal process. The third joint of that organ is elongate and clavate, the fourth more strongly arcuate within, subsecuriform, elongate and strongly compressed.

T. bipuncticeps n. sp.—Rather slender, convex, polished, impunctate, piceous; elytra, legs and antennæ pale rufous. *Head* moderate, slightly longer than wide, convex; eyes large, convex, prominent, just behind the middle; genæ convergent, feebly arcuate, clothed with longer, dense pubescence; base broadly arcuate; antennal tubercle much wider than long, large, divided by a feeble canaliculation; antennæ as long as the head and

prothorax together, rather slender, basal joint as long as the next two together, subcylindrical, second narrower, second and third slightly longer than wide, the latter slightly shorter and narrower, four to eight equal in width, slightly shorter but scarcely narrower than the third, ninth wider, nearly as long as wide, tenth wider than the ninth, wider than long, eleventh distinctly wider than the tenth, ovoidal, acuminate, as long as the three preceding together; on a line through the anterior portions of the eyes there are two small, very widely distant nude punctures; fourth joint of maxillary palpi dilated internally, truncate at apex, having a slender terminal process. *Prothorax* distinctly wider than the head, one-fifth wider than long; sides strongly rounded just before the middle, convergent and very feebly sinuate toward base; the latter evenly, feebly arcuate, four-fifths as wide as the disk, one-third wider than the apex; the latter truncate; disk strongly convex, with a row of small punctures along the basal margin, very feebly impressed at each side near the base, with a small, deeply impressed, nude fovea in the middle and very near the basal margin. *Elytra* near the apex nearly twice as wide as the prothorax; sides moderately divergent from base to apex, arcuate; disk fully as long as wide, convex; sutural striae distinct, strongly arcuate; discal fine, distinct, terminating at the middle; humeri rather strongly tumid. *Abdomen* much shorter than the elytra, parabolically rounded throughout; border narrow, rapidly becoming extinct; surface convex and declivous posteriorly from the apex of the first visible segment; the latter as long as the next two together, transversely very feebly convex. *Legs* long, slender, simple; tarsi slender. *Metasternum* broadly and strongly impressed along the middle; posterior coxæ rather widely separated. Length 1.4 mm.

California (Lake Tahoe 2).

The type specimen is a male, the under surface of the abdomen near the apex being broadly and feebly impressed. With this specimen I have associated a female, which differs considerably in the much shorter elytra, with more strongly divergent sides; but the material is insufficient to permit definite conclusions regarding its identity.

The individual facets or granules upon the surface of the compound eyes are circular and very widely separated.

This species is very nearly related to *sonomæ*, but differs in its slightly more robust form and slightly more transverse prothorax, with more angulate sides. It occurs under chips and bark slightly buried in grassy turf.

ACTIUM Casey.

Through the kindness of Herr Reitter, of Mödling, Austria, who has sent me several representatives of *Trimniopsis*, I am enabled to give the following statement, showing the relationship of the latter with *Actium*, *Trimniopsis* being represented by *T. Eygersi*.

The maxillary palpi of *Trimniopsis* are long, the fourth joint being more strongly dilated internally near the base, and therefore distinctly securiform; while in *Actium*, as represented by *pallidum*, the palpi are shorter, more robust, and with the outer joint ovoidal and acuminate. In *T. specularis*, however, the palpi are more robust and do not differ so greatly from the form existing in *Actium*.

One of the most conclusive differences, however, is the presence of a distinct discal stria, extending for one-half to two-thirds the elytral length in *Actium*, and the complete absence of this stria in *Trimniopsis*.

In *Trimniopsis* the isolated fovea at the base of each elytra, between the discal and sutural striæ, which is a constant character of *Actium*, is completely wanting.

Several species of *Trimniopsis* have two basal abdominal carinæ, these being very widely distant in *T. specularis*; others, however,—eg. *Eygersi*—are entirely devoid of the basal carinæ. In *Actium* the basal carinæ are distinct and rather approximate.

The species of *Trimniopsis* are much smaller than those of *Actium*, and have the head relatively much larger.

Actium also appears to resemble, to some extent, the much more minute African species, recently described under the name *Periplectus* by Raffray,

It is probable that the species described from the eastern parts of the United States under the name *Trimium* might more appropriately be referred to *Trimniopsis*, as the European genus *Trimium* has not yet been discovered within our territories.

A. pallidum n. sp.—Form rather slender, convex; pale flavo-testaceous throughout, antennæ and legs slightly paler and less rufous; integuments polished, impunctate; pubescence fine, short, subrecumbent, rather sparse. *Head* small, very much narrower than the prothorax; as long as wide; eyes rather large and prominent, somewhat finely granulated, at the middle of the sides; genæ distinctly shorter than the eyes, evenly rounded to the neck, not at all prominent; base very feebly sinuate; occiput longitudinally impressed in the middle; front having two round, impressed, spongiose foveæ on a line through the middle of the eyes, mutually twice as distant as either from the eye, connected by a subangulate channel which is rather strongly impressed and much wider than long; antennæ short, one-half longer than the head, club very robust, two basal joints subequal, slightly longer than wide, more robust than the funicle, joints three to seven moniliform, subequal, the former slightly longer than wide, the latter slightly transverse, joints eight to ten very short and strongly transverse, equal in length, acutely rounded at the sides, the former twice, the latter more than three times as wide as long, eleventh much wider, ovoidal, gradually acuminate, as long as the five preceding together. *Prothorax* widest at one-third the length from the apex, where it is scarcely as wide as long; sides rather broadly rounded, feebly convergent and nearly straight toward base; the latter evenly and rather strongly arcuate throughout, fully four-fifths as wide as the disk, one-half wider than the apex; disk convex, having at one-fourth the length from the base a transverse, narrow, deeply impressed, posteriorly arcuate channel, connecting the rather large, deeply impressed, spongiose lateral foveæ and continued posteriorly more than one-half the distance to the basal margin by a canaliculate impression; along the basal margin, very near the edge, there is a narrow deeply-impressed line. *Elytra* at the humeri much wider than the prothorax; sides feebly divergent, arcuate; humeri rather prominent; together fully as long as wide; disk feebly convex, each trifoveate at base; sutural stria fine, deep, nearly straight; discal proceeding from the third fovea, fine, nearly straight, parallel to the sutural, slightly double at base, vanishing at a slight distance before the middle; second fovea without trace of stria. *Abdomen* distinctly shorter, but very slightly narrower than the elytra, rapidly declivous behind, parabolically rounded through its apical half when viewed vertically; border narrow, slightly inclined; first segment slightly longer than the second, having at base two fine, slightly divergent carinæ which are very short and distant by less than one-fifth the abdominal width. *Legs* slender. Length 1.2 mm.

California (Monterey Co.)

This species is abundant under decomposing vegetation, near the margins of small streams.

A. politum n. sp.—Form slender, convex; bright testaceous, legs and antennæ slightly paler, more flavate, abdomen darker, castaneous; integu-

ments polished, impunctate; pubescence fine, short, sparse. *Head* small, as long as wide, distinctly narrower than the prothorax; eyes rather small, at the middle of the sides, convex; genæ distinctly longer than the eyes, arcuate, not prominent; occiput feebly impressed in the middle; front having two large spongiöse foveæ on a line through the posterior portions of the eyes and mutually twice as distant as either from the eye, connected by a subangulate impressed groove; antennæ short, slender, scarcely one-half longer than the head, club large, elongate, two basal joints more robust, subequal, slightly longer than wide, joints three to seven moniliform, the latter globular, eighth very slightly wider, a little wider than long, eight to ten very gradually wider and more transverse, equal in length, the latter oval and scarcely twice as wide as long, eleventh nearly twice as wide as the tenth, cylindro-conoidal, acuminate, truncate at base, elongate, nearly as long as the five preceding together. *Prothorax* widest at two-fifths the length from the apex; sides rather strongly rounded, distinctly convergent and feebly sinuate to the basal angles; base feebly arcuate, scarcely more than two-thirds as wide as the disk, one-third wider than the apex; disk convex, about as wide as long, crossed at one-third the length from the base by a narrow impressed groove which is nearly straight; lateral foveæ large, spongiöse, deeply impressed; median posterior prolongation rather broadly impressed; basal margin feebly impressed. *Elytral* width at the humeri, which are distinctly prominent, much greater than that of the prothorax; sides very feebly divergent, evenly and strongly arcuate; together as long as wide, transversely truncate at apex; disk feebly convex, each trifoveate at base; sutural striæ deep, feebly and evenly arcuate, rather distant from the suture; discal feebly arcuate, parallel, vanishing very slightly behind the middle, distinctly double at base. *Abdomen* distinctly shorter and narrower than the elytra; sides parallel and straight at base, rounded behind; border rather narrow; first visible dorsal with two fine subparallel basal carinæ which are nearly one-third as long as the segment and separated by nearly one-fourth the abdominal width. *Legs* slender. Length 1.3 mm.

California (Mendocino Co. 1).

Easily known by its dark abdomen, slender antennæ and smaller eyes.

A. robustulum n. sp.—Rather robust, convex, pale testaceous throughout; integuments polished, impunctate; pubescence fine, short, subrecumbent, not dense. *Head* very small, nearly as wide as long, much narrower than the prothorax; eyes moderate, convex, prominent; genæ distinctly longer than the eye, not prominent, rounded; occipital foveæ large, on a line through the posterior portions of the eyes, mutually twice as distant as either from the eye, connected by an impressed angulate groove; antennæ short and slender, scarcely one-half longer than the head, club gradual, elongate, two basal joints subequal, slightly more robust, longer than wide,

three to seven nearly equal in width, the former much longer than wide, the latter distinctly wider than long, ninth to eleventh uniformly and rather rapidly increasing in width, the ninth one-half wider than long, slightly shorter than the tenth, the latter fully twice as wide as long, eleventh elongate, acuminate, as long as the four preceding together. *Prothorax* widest before the middle; sides rounded, convergent and feebly sinuate toward base; the latter evenly and distinctly arcuate, four-fifths as wide as the disk and one-half wider than the apex; disk convex, very slightly wider than long; basal groove at nearly one-third the length from the margin, feebly, posteriorly arcuate, very deeply impressed; lateral foveæ large, deeply impressed, median posterior cusp shaped prolongation large and long; surface broadly and very feebly impressed anteriorly from the lateral foveæ, and with traces of a narrow median canaliculation near the center of the disk. *Elytra* at the somewhat prominent humeri distinctly wider than the prothorax; sides very feebly divergent, strongly and evenly arcuate; disk about as long as wide, convex; sutural striæ deep, arcuate; discal fine, distinct, nearly parallel, extending to or very slightly beyond the middle; intermediate basal fovea simple. *Abdomen* viewed vertically short and broad, three-fourths as long as the elytra, distinctly narrower; sides straight, parallel, broadly rounded behind; border rather narrow, inclined; first visible segment very slightly longer than the second; basal carinæ rather robust and flat, very feebly divergent, less than one-third as long as the segment, distant by one-fourth the abdominal width. *Legs* moderate in length; femora robust, much more arcuate externally and toward apex, posterior more slender. Length 1.4 mm.

California (Anderson Val., Mendocino Co. 1).

The type is apparently a male, the penultimate segment being transversely and narrowly impressed; the terminal segment is flat, in appearance like a horizontal pygidium; it is slightly longer than wide, oval, slightly more attenuate behind, and entirely surrounded by the other segments. The species is much more robust than the others here described.

A. testaceum n. sp.—Form slender, convex; pale testaceous throughout; integuments polished, almost impunctate; pubescence very fine, short, sparse. *Head* moderate, distinctly narrower than the prothorax; eyes small, convex, prominent; genæ not at all prominent, much longer than the eye, rounded; occiput narrowly and deeply impressed in the middle; foveæ on a line through the posterior portions of the eyes, round, spongiose, scarcely twice as distant as either from the eye, connected by an impressed channel, which is more broadly arcuate than usual; antennæ scarcely one-half longer than the head, slender, nearly as in *robustum*. *Prothorax*

very slightly wider than long, almost exactly similar to that of *robustum*, except that the transverse basal groove is at scarcely more than one-fourth the length from the base. *Elytra* at the prominent humeri distinctly wider than the prothorax; sides feebly divergent, strongly arcuate; disk convex, about as long as wide; sutural striæ strong, arcuate; discal fine, distinct, terminating at the middle of the disk. *Abdomen* very slightly shorter and much narrower than the elytra, longer than wide; sides nearly parallel, straight, except in the apical fourth, which is parabolically rounded; basal carinæ less than one-third as long as the segment, fine, exactly parallel and straight, separated by slightly less than one-third the abdominal width. *Legs* rather short and slender. Length 1.2 mm.

California (Anderson Val., Mendocino Co. 1).

This species is very closely allied to the preceding, the type specimen, which is apparently a female, is smaller, much narrower, with a narrower, much more elongate abdomen and larger head. The form and position of the basal carinæ differ in the two species, being distinctly stronger and divergent in *robustum*, and finer and perfectly parallel in *testaceum*. Were it not for this character and the probability—because of the sexual characters—of the masculinity of the small-headed type of *robustum*, I should be persuaded to unite the two as very extreme specimens of a single species, but at present this does not appear to be admissible. Although both are from the same region, the localities in which they were taken were widely different.

The four species thus far described differ from *californicum*, as described by LeConte, in the extent of the discal striæ, these being two-thirds as long as the elytra in the latter. The number of species is probably considerable, as scarcely any organized attempt has been made to collect them.

EUPLECTUS Leach.

E. californicus n. sp.—Form slender, parallel, depressed; dark testaceous throughout, polished; pubescence fine, rather short, somewhat dense. *Head* rather large, slightly wider than long; eyes small, convex, rather prominent, at more than their own length from the base; genæ rounded, convergent, not prominent; base broadly sinuate; surface depressed, coarsely, deeply and rather densely punctate; having on a line through the

middle of the eyes, two small nude foveæ, mutually scarcely as distant as either from the eye, connected by a feebly impressed anterior groove; antennal tuberculations small, rather prominent; antennæ three-fourths as long as the head and prothorax together, moderately robust, club moderate, the joints nine to eleven gradually and uniformly wider, the latter oval, as long as the three preceding together; under surface deeply and densely punctate, with an impressed fovea in the middle at the base, without long erect setæ. *Prothorax* slightly shorter and narrower than the head, widest at one-third the length from the apex, very slightly wider than long; sides strongly rounded anteriorly, rather strongly convergent and nearly straight to the base; the latter broadly arcuate, two-thirds as wide as the disk, very slightly wider than the apex; the latter transversely truncate; disk feebly convex, with a slightly elongate foveæ near the center, a broad impression at one-fourth the length from the base, and, on each side, a large rounded deeply-impressed foveæ, at two-fifths the length from the base, not connected with the median impression; surface very feebly and not densely punctate. *Elytra* at the humeri slightly wider than the prothorax; sides nearly parallel, distinctly arcuate; together very feebly sinuate at apex; disk depressed, as long as wide, nearly one-half longer than the prothorax; sutural stria deep, very feebly arcuate; discal fine, distinct, slightly arcuate, vanishing slightly before the middle; each elytron with an isolated basal fovea near the sutural; surface very feebly, sparsely punctate. *Abdomen* as long as the elytra and distinctly narrower; sides straight and parallel; border narrow; surface feebly convex, finely, feebly and not densely punctate; first three visible dorsals equal in length; first two each impressed in the middle of the base; carinæ very short and nearly obsolete. *Legs* short; femora not robust; tarsi short and robust. *Metasternum* long, impressed along the middle. Length 1.3 mm.

California (Lake Tahoe 3).

The tarsal claw has a very minute hair-like appendage internally near the base, giving the appearance of a rudimentary second claw, but as all the characters are precisely similar to the European genus *Euplectus*, as seen in *sanguineus*, *signatus*, *Bonvouloiri*, etc., much more similar, in fact, than most of our Eastern *Euplecti*, it is impossible to believe that it belongs to a different group. I would prefer rather to consider this a tendency to revert to the normal condition of Coleoptera, and to hold that similar appearances may occasionally be exhibited in the European genus.

The type is a male, the sixth segment being deeply im-

pressed in the middle. The female does not differ appreciably in form.

The occurrence of a genuine *Euplectus* near the Pacific coast is a very interesting fact, as heretofore the genus has not been discovered west of the Rocky Mountains. The three specimens indicated were found under the bark of fallen trees, and the species appears to be very rare. It should be placed after *confluens* in our lists.

RHEXIDIUS n. gen. (*Euplectini*)

Tarsi with two unequal claws; antennæ straight, basal joint not conspicuously elongate, widely separated at base. Posterior coxæ contiguous. Prothorax without lateral teeth, having a median canaliculation, and two large lateral foveæ near the base connected by a fine transverse line. Antennæ eleven-jointed, short; club long and slender, three-jointed. Maxillary palpi small, slender; third joint oval, slightly longer than wide; fourth much longer than the three basal combined, slender, fusiform. First visible dorsal segment slightly longer than the second; second ventral in the middle as long as the next three together; posterior margins of the posterior segments strongly emarginate. Elytra with lateral subhumeral fovea and fine carina.

This genus is founded upon a small Californian species, bearing a great resemblance in many of its characters to *Oropus*, but differing in the structure of the antennæ and in the complete absence of lateral prothoracic teeth. It belongs in some of its characters near the African genus *Raf-frayia*, Reitter, but differs greatly in the pronotal sculpture and elytral structure.

R. granulosus n. sp.—Rather slender and depressed, pale ochreous-testaceous throughout, slightly shining; pubescence rather coarse, moderate in length, not very dense. Head much wider than long; eyes far down on the sides, rather small, feebly convex, at about their own length from the base, coarsely granulated; base broadly sinuate; occiput feebly impressed in the middle at base, having dorsally on a line through the middle of the eyes two small, very widely distant, nude foveæ, also near the apex a transversely and feebly arcuate groove, terminating in minute foveæ which are connected with the occipital foveæ by a finer groove; surface impunctate, rather densely covered with small, round, strongly elevated tubercles; antennæ distinctly shorter than the head and prothorax together, basal joint but very

slightly longer than wide, cylindrical, second shorter, slightly narrower, nearly globular, three to eight narrower, transverse, the latter twice as wide as long, ninth and tenth slightly more than twice as long, much longer than the eighth, nearly rectangular, the tenth very slightly the wider and longer, eleventh scarcely visibly wider than the tenth, very elongate and slender, gradually acuminate and as long as the five preceding joints combined. *Prothorax* but very slightly wider than the head, widest in the middle; sides near the basal angles just visibly sinuate, in the middle strongly rounded, near the apex very feebly sinuate; base broadly arcuate, two-thirds as wide as the disk, one-half wider than the apex; disk as wide as long, moderately convex, covered not very densely with small tubercles; median canaliculation rather fine, equal, terminating near the base and apex; lateral foveæ small, deeply impressed, spongiöse, at a little more than one-fourth the length from the base, connecting groove transverse, straight, very fine. *Elytra* slightly longer than the prothorax, at apex one-half wider than the latter, distinctly wider than long; humeri not at all prominent; together transversely truncate behind; disk feebly convex, rather sparsely and more coarsely tuberculate, each with three basal foveæ and four striæ, one evenly and feebly arcuate, two and three feeble, nearly equal, one half as long as the elytra, four stronger, one-third as long as the elytra. *Abdomen* very slightly wider and longer than the elytra; sides arcuate; border rather strong, inclined; surface rather strongly convex, scarcely visibly tuberculate, *Legs* rather slender. Length 1.0 mm.

California (Alameda 4).

The sexual differences are apparently very feeble, the terminal segment in the male being feebly impressed. The mesosternum is bicarinate.

OROPUS Casey.

O. montanus n. sp. — Form slender, rather depressed, uniform dark rufo-testaceous throughout; integuments polished, not perceptibly punctate; pubescence fine, rather long, not dense. *Head* triangular, shorter and narrower than the prothorax; eyes rather small, not very prominent, at slightly more than their own length from the base; genæ strongly convergent, feebly arcuate; base broadly sinuate; base of occiput longitudinally impressed in the middle; occipital foveæ deep, distant, on a line through the posterior limits of the eyes, connected by a narrow, deeply impressed, arcuate groove, much shorter than wide; antennæ short, robust, distinctly shorter than the head and prothorax together, club elongate, rather feeble, joints three to eight transverse, the former slightly wider than long, the latter more than twice as wide as long, ninth and tenth joints twice as wide as long, nearly rectangular, tenth just visibly wider and longer than the ninth, eleventh

distinctly wider than the tenth, nearly three-fourths longer than wide, conoidal, acuminate. *Prothorax* widest in the middle, where the sides are strongly rounded, thence strongly convergent toward base and apex, very feebly sinuate near each limit; base broadly arcuate, scarcely two-thirds as wide as the disk, one-half wider than the apex; the latter feebly arcuate and less than one-half as wide as the disk; lateral teeth minute, in a transverse line with the lateral foveæ; the latter deep, at slightly less than one-third the length from the base, connected by a fine, posteriorly arcuate groove; median canaliculation fine, crossing the transverse groove; obsolete near the base and apex, not at all dilated except near its basal limit; disk about as long as wide. *Elytra* scarcely one-fifth longer than the prothorax, at apex nearly one-half wider than the latter; disk distinctly wider than long, feebly convex; stria one nearly straight, two slightly arcuate, united with one at one-third the length from the apex, three two-thirds and four one-half as long as the elytra respectively, all deeply impressed. *Abdomen* nearly as wide as and distinctly longer than the elytra. *Legs* rather short and robust. Length 1.8 mm.

California (Placer Co. 1).

Described from the female. It can very readily be distinguished from all the species previously known by its slender form, short elytra and peculiar disposition of the elytral striæ.

SONOMA Casey.

S. corticina n. sp. — Linear, depressed, pale testaceous throughout; pubescence fine, rather short, not dense. *Head* slightly wider than long, a little shorter and narrower than the prothorax; eyes small, at the middle of the sides; genæ long, rounded, longer than the eyes and nearly as prominent; front feebly convex, impunctate, having, at nearly one-third the length from the base, two small nude punctiform foveæ, mutually slightly less distant than either from the eye, and, at the vertex, behind the line of the antennæ, a large, deep circular fovea which is completely nude; antennæ one-third longer than the head and prothorax together, slender, feebly clubbed, first joint much longer and slightly more robust than the second, the latter nearly one-half longer than wide, oval, joints three to eight mouiliform, gradually shorter, the latter slightly wider than long, joints eight to ten similar in form, gradually slightly larger, eleventh slightly wider than the tenth, a little longer than wide, obtusely acuminate, not as long as the two preceding together; under surface transversely and feebly impressed just behind the mentum, and more deeply so along the basal margin; fourth joint of the maxillary palpi longer than wide, compressed, oval, having a distinct terminal process. *Prothorax* widest in the middle; sides broadly rounded to the neck, convergent and distinctly sinuate near the base; disk

slightly wider than long, feebly convex, having a transverse anteriorly arcuate impression near the base which terminates laterally in two small punctiform foveæ and which is more deeply impressed in the middle, also just before the middle two minute punctiform foveæ, separated by one-fifth the entire width, and at each edge at one-fourth the length from the base, a large disconnected deeply impressed fovea, the impression being continued more feebly to the basal angles. *Elytra* depressed, at the humeri slightly wider than the pronotum; sides nearly parallel, more strongly arcuate behind; together truncate at apex, nearly as long as the head and prothorax together; sutural striæ deeply impressed, beginning at a slight distance from the base; discal broadly impressed, vanishing near the middle, coarsely foveo-punctate; between this and the sutural a few foveate punctures near the base arranged longitudinally. *Abdomen* slightly longer and wider than the elytra; border wide, slightly inclined; first visible dorsal much shorter than the second, having near the apex a transverse interrupted spongiöse line. *Legs* rather short and robust. Length 1.4-1.6 mm.

California (Mendocino Co. 8).

This species was found rather abundantly under the bark of fallen trees in the Anderson Valley; it differs from *parviceps* in its larger head, and from *isabellæ* in color and in its less robust form.

S. cavifrons n. sp.—Slender, depressed, pale testaceous throughout; pubescence fine, short, suberect, not dense; integuments polished. *Head* small, much smaller and narrower than the prothorax, as long as wide, eyes moderate in size, prominent, finely granulate; genæ convergent, rounded, not at all prominent, as long as the eyes; base feebly sinuate; surface impunctate, having posteriorly two small round feebly impressed foveæ, mutually slightly less distant than either from the eye, and, just behind the strongly elevated transverse frontal ridge, a longitudinally elongated, very deeply excavated fovea which is slightly spongiöse and more attenuated posteriorly; antennæ slender, slightly longer than the head and prothorax together; first joint longer than wide, robust, oval, second shorter, less robust, oval, one-half longer than wide, third small, narrowest, four to seven subequal, much larger than the third, joints three to seven slightly longer than wide, eight as wide as long, nine and ten slightly larger, very little wider than long, eleventh slightly wider than the tenth, longer than wide, acuminate, shorter than the two preceding together. *Prothorax* widest at one-third the length from the apex, where it is distinctly wider than long; sides strongly rounded, convergent and sinuate toward base; the latter broadly arcuate, three-fourths as wide as the disk, more than one-third wider than the apex. *Elytra* at the humeri distinctly wider than the prothorax; sides feebly divergent, more strongly arcuate behind; together slightly longer than wide, as long as the

head and prothorax together, depressed; sutural series of four impressed foveæ at the base; the sutural stria deeply impressed and continuous only from the fourth fovea; discal impression coarsely foveate, terminating before the middle; between them a basal series of two or three foveæ. *Abdomen* as wide as and slightly longer than the elytra; border wide. *Legs* short and rather slender. Length 1.9 mm.

California (Mendocino Co. 1).

The pronotal foveæ and spongiose band of the abdomen are nearly as in *corticina*. This species is abundantly distinguished from the preceding and from *isabellæ*, Lec. by its smaller head and pale color respectively, and from *parviceps* Mäkl, which it must more nearly resemble, in its smaller size. The present species was found with the preceding under bark, and, as the Alaskan form inhabits grassy places, the two are probably distinct.

S. isabellæ Lec.—Two specimens of this species, collected by Mr. C. Fuchs, at Alameda, differ greatly from those here described in the shorter, more robust antennæ, with more transverse joints, in the intense black color with testaceous elytra, and in the complete absence of the two discal punctures of the pronotum. They were found in decomposing vegetable mould.

EXPLANATION OF THE PLATE.

The accompanying plate is somewhat experimental, the figures being reproductions by means of photography and gelatine printing, of shaded lead-pencil drawings. Should this attempt be deemed successful, the process must assuredly become popular among entomologists, as it is far easier and less trying to the eyesight to make satisfactory drawings in soft pencil than in ink stipple.

Fig. 1—*Nisaxis cincinnata* Cas.

Fig. 2—*Biotus formicarius* Cas.

Fig. 3—*Eutrichites* (*Zimmermanni* ?) Lec.

Fig. 4—*Oropus interruptus* Cas.

Fig. 5—*Bryaxis texana* Cas.

Fig. 6—*Tychus sonomæ* Cas.

Fig. 7—*Actium pallidum* Cas.

Fig. 8—*Rhexidius granulosus* Cas.

Fig. 9—*Thesium laticolle* Cas.

Fig. 10—*Sonoma corticina* Cas.

NOTE.—The drawings are taken from typical representatives in all cases except *Eutrichites* Lec. and *Thesium laticolle* Cas., which I have identified from the original descriptions. With reference to the former, it may be stated that the specimen figured agrees very well generically, but not so well specifically, with the description of LeConte. For example, the apical fovea of the front is stated to be smaller than the occipital in *Zimmermanni*, whereas in the representative figured it is in the form of a broad, indefinite impression without trace of fovea. The specimens here figured were found at Austin, Texas.

CALIFORNIAN MANZANITAS.

A Partial Revision of the *Uva-ursi* Section of the genus *Arctostaphylos*,
Adans., as Represented on the North American Pacific Coast.

BY C. C. PARRY.

Read June 20th, 1887.

California is the native home of the "*Manzanitas*," confining the application of this well known common name to the *Uva-ursi* Section of the botanical genus ARCTOSTAPHYLOS, Adans.

Though the typical species on which the genus was founded (*A. Uva-ursi*), is barely found within its northern limits, the more conspicuous forms, including not less than twelve species, constitute a marked feature of Californian scenery, and are everywhere recognized as among its most attractive floral displays.

Having several years ago undertaken a partial revision of the genus *Arctostaphylos* in Proceed. Dav. Acad. Science, Vol. IV, 31-37, the writer was naturally interested in continuing those observations, and being materially aided by free access to the valuable collections and library of the California Academy of Science, it seems eminently proper to present the results to the scientific public through the medium of the California Academy Bulletin.

At the time of the publication above referred to, I very naturally inferred that the commonly received species, as described in current systematic botanical works, were clearly defined, and referred to properly authenticated names. It was therefore a matter of no little surprise to find as the result of careful field observations, that though as growing plants distinct species could be readily recognized, the published descriptions, on account of imperfect material,

or in some instances erroneous mixing of specimens in different stages of growth, could not be made to agree with actual living species. In endeavoring to rectify these unavoidable errors, no doubt largely due to a too exclusive reliance on dried specimens for systematic definition, I was obliged in the first instance to take into consideration that widely applied name of *Arctostaphylos pungens*, HBK, which has heretofore absorbed most of the poorly defined forms brought back in collections, not alone from its original location on the table-lands of tropical Mexico, but extending northward along the Sierra-Madre, and appearing again in unusual rich development on the North Pacific coast, and the Californian Sierra Nevada. Aside from the extreme improbability that a shrub of such peculiar character, not easily adapting itself to changed conditions, either in nature or cultivation, should exhibit such a wide geographical distribution—neither the published figures of the true Mexican plant, nor the original description could, except by a forced construction, apply to our well known Californian *Manzanita*, as seen in the lower foot-hills or the high Sierras. I have therefore undertaken to give a complete and detailed description of this species, combining the common with the botanical name, viz.:

Arctostaphylos Manzanita.

Another species, presenting very constant and distinct characters, such as no one in the field would fail to recognize, in its dense gregarious habit and singular glaucous foliage, has been strangely confounded with the widely distinct *A. glauca*, Lindl., with which it agrees only in leaf characters. As this common foot-hill *Manzanita*, ranging from Southern Oregon to Central California, and possibly beyond, has never yet been clearly defined, I have herewith named, from a very marked character of the inflorescence, *Arctostaphylos viscida*.

Besides the above, my attention has also been called to another undescribed species of remarkable delicacy and

beauty, first collected in fruiting specimens by Mrs. M. K. Curran in Lake County, in 1886, and during the present season abundantly gathered in all stages of growth by the writer, in the vicinity of Calistoga. Desirous of recognizing in some suitable way the facilities for botanical exploration extended to myself and others in California by Hon. Leland Stanford, I have, with his permission, dedicated this interesting species, which I hope to be able to introduce into cultivation, viz.: *Arctostaphylos Stanfordiana*, to the memory of his son, Leland Stanford, Jr., whose name is to be associated with a richly endowed institution for the advancement of human knowledge.

While postponing for the present the consideration and possible settlement of the vexed question of determining just how far the aggregation of constant characters as the result of enlarged exploration, may justify the raising of sub-genera or sections to full generic rank—which is especially urgent in view of the polymorphous character which is now assumed by the genus *Arctostaphylos* in more recent botanical works—I must content myself with a synoptical arrangement of all the known species, heretofore included in Section *Uva-ursi*, giving detailed descriptions of such only as are new, or corrected notes of such as are imperfectly known or wrongly defined.

Preliminary to this, some general observations on the ordinary botanical features, that may aid in discriminating species as observed in the field, is herewith submitted.

GENERAL OBSERVATIONS.

Notwithstanding considerable diversity in habit and growth, varying from low procumbent to almost arborescent forms, this *Uva-ursi* group presents certain uniform features, probably justifying its retention as a distinct genus, under the earliest applied name, *Arctostaphylos*, Adans., separated generically from the other allied groups

with which it has been combined in later systematic works. Thus viewed in all forms, they are densely branched, shrubby plants, with smooth reddish bark, renewed annually by an exfoliation of that of the previous season, which, by the swelling of the branches at the time of growth in May or June, detaches the old in loose flakes, showing beneath, the light greenish new bark becoming tawny-red on exposure, to go through the same process of decortication the next season. In the sub-arborescent forms the branches thickly set on the base of the irregular trunk, project their rigid and crooked limbs in every direction, forming dense, almost impenetrable thickets.

The evergreen foliage, varying in tint from bright vivid to dull green, or glaucous, is smooth, or roughly pubescent, rarely tomentose, and usually entire, the different species generally presenting well marked specific distinctions in shape and texture. Of these, *A. Andersoni*, Gray, is exceptional in its frequent sharply serrate leaves, though in all seedling plants observed, the earliest growth succeeding the cotyledons is invariably serrate, in this respect corresponding to the interesting observations of Prof. Greene in regard to the early growth of *Prunus occidentalis* on Sta. Cruz Island. The usual vertical twist to the petioles, giving the leaves a perpendicular direction, is one of the features common to many shrubs in arid districts, with the obvious result of checking evaporation by less direct exposure to the vivid rays of the summer sun.

The inflorescence always terminal on the growing shoots, is provided for by fully formed buds of the previous season protected by their characteristic bracts, thus prepared to develop their delicate urceolate corollas as early as the season of growth will allow, in favorable seasons attaining a full development by January or February.

The usual form of inflorescence is a panicle, with more or less extended or divaricate lateral and terminal racemes. The subtending bracts are usually quite characteristic in the

different species, usually somewhat rigid and persistent, more rarely thin hyaline and deciduous, the pair of bracteoles at the base of each pedicel, inconspicuous and evanescent. The pedicels, usually exceeding the bracts, are slender or thickened upwards, smooth or pubescent, in some instances viscid-glandular. The corollas are very uniform in character and offer scarcely any features of specific value, being urceolate in shape, white or delicately rose-tinted, deciduous and enclosing a whorl of ten stamens, with appendaged anthers, and filaments dilated and hairy at base. The single style with its short lobed stigmas, exceeds the ovary, and is more or less persistent on the forming fruit. The fruit, technically termed a *nuculanium*, varies in size from one-fourth to one-half inch in diameter, is usually orbicular in shape, occasionally flattened horizontally, and deeply umbilicate, more rarely oblong and acuminate; it is composed of a thin outer pericarp, smooth or pubescent, occasionally glandular-viscid, the color at maturity is a dull white, sometimes with a reddish tint, which soon changes to a dull brownish yellow, and later to a deep mahogany; this encloses within a more or less copious granular sub-acid pulp, a radiating series of osseous nutlets (*Pyrenæ*), varying from five (the normal number) to seven or eight; these are either loosely united at the ventral edge and easily separable into one-celled divisions, or the separate cells are irregularly coalescent presenting an unevenly lobed nutlet, or more rarely consolidated into a regular solid stone; when separable, each developed nutlet contains a single pendulous seed, composed of a slender erect radicle, and small cotyledons, enclosed in fleshy albumen. When the nutlets are irregularly coalescent the larger divisions include several distinct and fertile cells, and in case of the complete consolidation, the cross-section shows the open cells with inclosed embryo imbedded in the dense woody tissue, only the larger cells being fertile. That this variable character is not as at one time supposed of generic value, is evident in the fact that a

continuous series can be traced from the distinctly separated nutlets through the partially to the completely consolidated drupe. It has seemed important to dwell on these details of botanical characters, as it is only by a combined view of all, that species as they exist in nature, can be properly distinguished.

GEOGRAPHICAL DISTRIBUTION.

Not until such time as the species are correctly determined, can any satisfactory views be taken of geographical distribution. Judging, however, from such as are well known, the range of species is quite strictly limited by the peculiarities of soil, climate, and exposure, to which they are adapted. This is no less true of the world-wide species *A. Uva-ursi*, which in encircling the globe does not extend beyond that degree of north latitude, or elevated exposure, which is suited to its boreal habit, than of the analogous *A. pumila*, Nutt., confined as far as is known to the sandy wastes of Monterey, or the vicinity of San Francisco. Equally may it be inferred that the peculiar Californian species will not be found outside of the peculiar climatic conditions to which they are adapted, the more so as their structure and limited reproductive characters are not adapted to cosmopolitan habits. It is therefore reasonable to conclude that several of the more southern forms, heretofore referred to known species, will on careful examination be found distinct, and thus justify the opening paragraph, that California is, *par excellence*, the home of the *Manzanitas*. Hoping at some future time to verify or disprove these suggestions, I will now simply indicate such species as may at present be accepted, in a preliminary synoptical arrangement, viz.:

ARCTOSTAPHYLOS, Adans.

‡ UVA URSL. Gray, Synop. Fl. II, Part I, 27; Parry Proc. Dav. Acad. Science, Vol. IV, 31-37.

1. *Fruit with Pyrence distinct, or more or less coalescent.*

**Low prostrate shrubs.*

1. **A. Uva-ursi** Spreng.

The typical species on which Adanson established the genus as distinct from *Arbutus*. This author did not however include the species afterwards united as *A. alpina*, Spreng., which, on account of its very distinct characters, is better referred back to an older genus *MAIRANIA*, Neck. viz.: *M. alpina* Desv.

2. **A. pumila** Nutt ; Gray, l. c.

This species, first collected by Nuttall in 1836, and described only from leaf specimens, has been long regarded as a doubtful species, and is still imperfectly known. During the present season (1887) the original locality was visited by the writer, on sandy wastes bordering the eastern shore of Monterey Bay. It here forms densely spreading mats, several yards in extent, with assurgent branches, thickly covered with small ovate or spatulate leaves, of a dull green color, lighter beneath, pubescent when young, entire, and short-petiolate; these conceal from view the small clusters of fruit mature in July. The inflorescence is a contracted raceme, with rather conspicuous veiny bracts, shorter than the smooth pedicels, flowers small pinkish-white; the fruit is orbicular, yellowish-brown at maturity, the separable nutlets closely adjoining, broadly carinate, and smooth on the external face, occasionally partly coalescing into irregular, two-celled stones. In the above characters it is clearly marked as a distinct species, of very limited range, and has been known for several years, from an isolated locality at Lone Mountain Cemetery, San Francisco, where it was first detected by the late Dr. Kellogg, and by him properly referred to the Nuttallian species.

3. **A. Nevadensis** Gray l. c.

Confined to the alpine districts of the Sierra Nevada, and clearly distinguished in its peculiar habit, from the mountain form of *A. Manzanita*, with which it is occasionally associated.

* * *Erect shrubs, approaching arborescent.*

A. Hookeri Don, Gard. Dict. III, 836. Gray l. c.

Arbutus ? pungens Hook. & Arn. Bot. Beech. 144.

Xerobotrys, venulosa Nutt. Benth. Pl. Hartw. 321.

Short depressed stems, with erect branches, forming loose clumps 1—3 feet in height; young branches and petioles closely pubescent; leaves smooth, bright green on both sides, distinctly veined, ovate, and gradually tapering at base to a slender twisted petiole, cartilaginous-mucronate, and on vigorous shoots occasionally irregularly mucronate-serrate; inflorescence short-racemose, bracts membranous, attenuate, longer than the smooth pedicels, deciduous in fruit, calyx with thin ciliate margins, corolla small, narrowly urceolate; fruit smooth, yellowish-brown at maturity (July), orbicular, flattened horizontally, deeply umbilicate at base, 3 lines broad, 2 lines high, granular pulp rather copious, nutlets separable, rough carinate on the back, and acute at the ventral edge at the base, when less than five, one or more coalescing to form a 2—3 celled stone.

Long known from all the early collectors in the vicinity of Monterey, but poorly defined from imperfect fragmentary material. A recent opportunity for field examination affords the means for completing the description.

5. **A. Andersoni** Gray l. c.

Apparently limited in range to the Santa Cruz Mountains.

6. **A. tomentosa** Dougl. Gray l. c. excl. Southern and Mexican forms.

This is one of the oldest and best known species, having been fairly well figured, and occasionally seen in cultiva-

tion. Notwithstanding variation in habit, and degree of pubescence, shape of leaves, etc., it is readily distinguished in the field, forming usually a low spreading bush, with dull green foliage, hispidly ciliate young branches, and very conspicuous floral bracts, occasionally becoming foliaceous, and generally exceeding the hairy pubescent pedicels, both the ovary and forming fruit are more or less hairy pubescent, but not glandular. It is usually later in flower than other species with which it is frequently associated, thus obviating a confusion that is likely to arise from hybridization. The fruit maturing in August shows the usual character of nutlets, more or less separable or coalescent. Specimens from Southern California and Arizona, extending into Mexico (one of which is characterized below as *A. Pringlei*), heretofore referred to this species, are clearly distinct.

7. **A. Manzanita.** *A. pungens* of various authors, not HBK.

Shrubby to sub-arborescent, 5—25 feet in height, bark smooth, dark reddish brown, renewed annually, younger branches more or less closely pubescent; leaves petiolate, about one-third the length of the blade; smooth, dull green on both sides, entire, varying in shape from narrowly to broadly ovate, usually obtuse at the apex, and abruptly short mucronate, rounded or tapering at the base; inflorescence paniculate, the divisions more or less prolonged, rachis hoary-pubescent, and thickening upwards, bracts broad, acuminate, rigid and persistent, externally pubescent; pedicels smooth, exceeding the bracts, calyx with broad orbicular segments, corolla broadly urceolate, stamens with slightly bearded filaments, style included; fruit smooth, irregularly orbicular, 4—6 lines broad, 3 lines high, dull white at early maturity, becoming reddish-brown with age, nutlets irregularly coalescent, usually one or more broader, with 3 fertile cells, with intermediate 1-celled nutlets, more sharply carinate, the whole including 5—7 fertile cells.

Varying greatly in size from a low bush in the higher mountain districts, to a small tree, with low branching trunk, often over a foot in diameter. It differs from the Mexican *A. pungens*, HBK, to which it is has been usually referred, in its more robust habit, its broadly obtuse foliage, its prolonged inflorescence, size of fruit, period of flowering, etc.

It is one of the earliest flowering species, often in full bloom for Christmas decorations; in the higher mountains the flowering period is delayed till May; fruit matures in July and August. As a cultivated shrub it is rather shy, but succeeds tolerably well in natural parks, where it is least disturbed by the processes of cultivation. The leaves of young seedlings are always sharply serrate.

The geographical range of this species, as above defined, cannot at present be satisfactorily determined, though its fullest development is in the lower foot-hills of the coast range north of San Francisco, and on each side of the Sacramento Valley, thence extending in reduced forms to the high Sierras north and south, probably crossing the range into Nevada.

8. **A. viscida.** *A. glauca* in part, of various authors, not Lindl.

Branching from the base 5—15 feet high; branches smooth, reddish, leaves smooth glaucous, finely net-veined, petiolate, varying from broad ovate to sub-cordate or deltoid, entire, abruptly short-mucronate; inflorescence prolonged in a slender spreading panicle, rachis slender, smooth, bracts small, oval, acuminate, pedicels densely glandular-viscid, four to five times exceeding the inconspicuous bracts, which become coated with the copious adhesive viscosity; flowers light pink, calyx with thin margins. corolla short-urceolate, style slender, ovary smooth; fruit orbicular, horizontally flattened, and umbilicate at the base and summit, 3 lines broad, 2 lines high, light yellow to dull brown at maturity; pericarp smooth, copious white granular

pulp enclosing 4—5 rhomboidal nutlets, roughly carinate on the back, one or more broader containing 2—3 fertile cells.

Forming dense thickets on the middle foot-hills of the Sierra Nevada, from the Oregon line to Central California; flowering in March, fruit in July, clearly distinguished by the above characters from *A. glauca*, Lindl., with which it has been confounded. The remarkable viscidiness of the pedicels, which draws out into long threads on handling, also serves as a trap to insects, perhaps thereby serving some use in the vegetable economy. At the time of flowering it is one of the prettiest species, in the neat contrast of flower and foliage, being also attractive to swarms of buzzing insects attracted by the copious stores of honey. Though possibly shy of cultivation, its gregarious habit suggests adaptation to park ornamentation, if grown in clumps, as in its natural location.

9. *A. Stanfordiana*.

Low branching, 3—5 feet high, with slender dark-reddish stems smooth throughout; leaves bright green on both sides, narrowly ovate to oblanceolate, tapering below to a short narrowly-winged petiole, entire and mostly mucronate; inflorescence paniculate, prolonged and recurved; rachis smooth, dark red, bracts small, rigid, acuminate; flowers with deep red calyx and thin membranous corolla, light pink and broadly urceolate; style slender, becoming exsert, ovary smooth; fruit in pendent racemes, reddish yellow at maturity, uneven orbicular, flattened and umbilicate at base, nutlets broader than deep, lightly connected, carinate, usually two or more coalescent, more rarely all united into an irregular stone.

Covering extensive mountain slopes in the vicinity of Calistoga; flowering in March, fruit in July. Dedicated to the memory of Leland Stanford, Jr.

10. *A. insularis*, Greene in herb. *A. pungens*, Greene, Bull. Cal. Acad., Vol. II, 406.

Smooth throughout; branches light-brown, young shoots rusty green; leaves short, petiolate, ovate, narrowed at base, obtuse, muticous, conspicuously net-veined beneath; inflorescence paniculate, branching, racemes slender, prolonged, bracts short, deltoid, pedicels glandular, hairy (flower not seen); fruit smooth, yellowish-brown, orbicular, 3—4 lines wide, 2 lines high, nutlets irregularly coalescent, the ventral edge acute at base.

Island of Santa Cruz; E. L. Greene, July, 1886.

A symmetrically branched shrub 4—7 feet high, with bright green foliage, and, judging from the fully formed buds (in July), flowering early in the winter. It can hardly be regarded as an insular variety of *A. manzanita*, the characters above specified seeming constant, and when observed in full flower, it will no doubt exhibit other well marked specific distinctions.

11. *A. Pringlei*.

Young branches, including the petioles and margins of the leaves, copiously ciliate-pubescent, with mixed glandular hairs, leaves short, petiolate, glaucous, minutely net-veined, with conspicuous mid-nerves, ovate to broadly subcordate, abruptly short mucronate; inflorescence closely paniculate from a thickened base, intermixed with bud-scales, indicating a late flowering period, racemose branches slender, thickly covered, as well as the bracts, pedicels and calyx, with ciliate and glandular hairs, bracts lanceolate membranous, petaloid, deciduous, bracteoles linear nearly one-half as long, pedicels slender, divaricate, 4—5 times as long as the bracts, calyx ciliate-glandular, corolla smooth, broadly urceolate; ovary and fruit glandular, hispid, nutlets irregularly coalescent, 5—7-celled.

Mountains of Lower California; C. R. Orcutt, July, 1884;

C. G. Pringle, Arizona, 1885. Distributed as *A. tomentosa*, Dougl., but clearly distinct.

Variety? *drupacea*. Differing from the above only in the completely consolidated stone, deeply sculptured, and usually with a conspicuous one-sided furrow.

Mountains east of San Diego; C. R. Orcutt. No. 543; September, 1886. Distributed as *A. glauca*, Lindl. More material desired for satisfactory determination.

Extra-limital (Mexican).

12. *A. pungens* HBK. excl. synonyms.

2. *Pyrence united into a solid putamen.*

13. *A. glauca* Lindl.

Ten to twenty-five feet in height, branching from the base, with a trunk often more than one foot in diameter, branches and young shoots smooth throughout; leaves glaucous green finely net-veined, short petiolate, with a conspicuous mid nerve, ovate to broadly sub-cordate at base, either acute and sharply mucronate or obtuse with an abrupt mucro, young vigorous shoots frequently irregularly serrate resembling those of young seedlings; inflorescence paniculate prolonged with divaricate and pendent branches, bracts rigid spreading more or less, net-veined the lower foliaceous, pedicels 3 or 4 times exceeding the bracts, glandular-viscid (much less so than in *A. viscida*); flowers rather large, otherwise similar to allied species; fruit ovate, 9 lines long, 6 lines broad, resinous viscid, pericarp thin without granular pulp, stone smooth, usually sharply apiculate with regular perpendicular lines, with intervening netted veins, indicating the separate cells (5—8) more or less abortive.

From Mt. Diablo extending along the Coast range to San Fernando and foot-hills of San Bernardino. Readily recognized from all other species by its light green glaucous foliage, its rigidly persistent bracts, and especially by its

large solid stone. That it should be still properly included in the *Uva-ursi* group is apparent from the fact that it has all the general characters of growth and foliage belonging to that section, and that the solid stone is made up of coherent cells is shown by occasional lines of division, a sharp blow on the outside frequently breaking it along regular lines of separation. On the other hand the species heretofore associated with *A. glauca*, viz. : *A. bicolor*, Gray, exhibits such widely diverse characters of stem, foliage and general habit, as well as a perfectly solid stone, showing no indications of coherent cells, as to justify its re-establishment under the original name *Xylococcus bicolor*, Nutt.

WEST COAST PULMONATA; FOSSIL AND LIVING.

BY J. G. COOPER, M.D.

(Continued from page 376.)*

Santa Clara County.

The eastern half of this county, forming part of the Mount Hamilton range, has been sufficiently alluded to, and the mountainous corner of it in the map is only about half of that part of the range included in the county, while the same unproductive and lofty region extends nearly 200 miles toward the southeast.

The westerly side of the county is shown to be formed by the eastern slope of the Santa Cruz Mountains from near the head of San Francisco Bay and Black Mountain southeast to Pajaro River, thus enclosing Santa Clara Valley, a triangular space of about 200 square miles, little above the sea level. This valley, like the eastern shore of the bay, is supplied with species washed down by the mountain streams, but as far as known only by those from the west. In certain moist shady spots near the streams draining it, several species could formerly be found quite plentifully, but as these willow groves, etc., have been mostly cleared for gardens, few remain. I have thus found in the valley Nos. 1, 5, 11, 26, 30, 31, 32, 33, 35, 40, 42, 43, some of them hidden under logs, brush, etc., in the partial shade of the oaks, which formerly covered about half the drier parts of the valley. These are part of what I give in the table on page 367, as found south of the bay, and the rest naturally follow here.

* Errata, p. 374, line 14 from bottom, for 270 read 210.

The reader will observe that throughout I have used "Helix" in a general way for "Helicoid species," especially Nos. 26 to 39, in table on p. 367.

San Benito County.

Of this county only about 65 square miles are shown, in the triangle northeast of Monterey County and south of Pajaro River. Only one addition to the list is known from there, No. 45, found at "Soap Lake," a marshy expansion of Pajaro River, named from the great alkalinity of the water. This mineralization of the streams, together with the increased dryness of the county, cut off from much of the sea breeze by the high Gavilan range of mountains separating it from Monterey County, shows why the only Helioid species known from it is No. 32, though a few others may exist, as well as some of the smaller forms, *Limacoids*, etc.

Monterey County.

This extends from Pajaro River south for over 60 miles, and the little known of the species found south of the part on the map has been already given. The influence of the moisture from the ocean on this part is shown by the abundance of several species, between Monterey and Carmel Bays, even on the apparently unsuitable granitic soil, which is however partly covered with tertiary calcareous sandstone, wooded with pine, cypress and oak. There and elsewhere near by, are found Nos. 1, 5, 6, 11, 19, 21, 24, 25, 31, 34, 38, 41, and 42, all within 10 miles of the sea shore, and none are known from higher or more inland localities except No. 37, as stated on page 363. By comparing this with previous lists it appears that while about the same number of species occur as in Santa Clara County, about half of them are distinct, but mostly representative forms, and added together they make only 29 found south of San Francisco Bay, while there were 36 east of there (one of each list doubtful). Increased heat and dryness are the chief causes of this decrease in species.

Santa Cruz and San Mateo Counties.

Returning now north of Pajaro River we find the Santa Cruz range of mountains becoming the most prominent feature of these two counties, which have very little level land throughout. They rise nearly as high as those east of the bay, thus intercepting a greater portion of the moisture from the ocean than any counties yet mentioned. Most of the species of the east slope are the same as are found in Santa Clara Valley, but some are only found on the mountains, and though partly south of San Francisco Bay are included with those "west of the bay," because the same influence controls their distribution. This is, the moister and cooler climate on the west slope, and higher parts of the range, which extends to the eastern slope north of Black Mt., where the peninsula also becomes cooler from the water on both sides.

Santa Cruz County especially, is more densely wooded than any yet named, the redwood and fir, with some pine, having once covered nearly all the west slope, with oaks and other trees, chiefly evergreens, on the remaining surface, except portions covered by the dense shrubbery growing on steep slopes. This abundant shelter, with almost constant moisture from springs, streams, and fogs, in the dry season, and the additional element of abundant lime both in fossils and solid strata, in some parts up to 2811 feet, make it the most suitable region imaginable for land pulmonata. We accordingly found that some species were very abundant in local colonies where all these advantages were combined, and but for the desolating effects of the terrible fires that annually destroy parts of the forests, may suppose that they would be far more abundant and generally diffused.

The same concentration of species and of colonies at low elevations continues as was before mentioned, both decreasing in abundance with elevation, which fact may be partly explained by the greater evaporation and stronger winds

making fires more destructive, and by fewer moist sheltered retreats existing there.

Near the town of Santa Cruz have been found Nos. 1, 3, 5, 6, 9, 11, 12, 13, 19, 25, 26, 30, 31, 35, 39, 42, and most of them below 200 feet only. On the slope of the mountains northward where the pass marked 2216 crosses the summit, the exposure to the sun seems too great for many to live except in the deep cañons, but on the northerly descent Nos. 1, 5, 9, 11, 25, 26, 30, 33, 39, are found near the reservoir, about 1400 ft. alt., and down to the base of the range, where a form occurs between 30 and 32 in character. No. 42 lives about some little marshy lakes at summit of the pass, where others would doubtless exist if they ever got there. Those of Santa Clara Valley occur sparsely, from the foot of the pass northward, to Black Mt., where the fossils are found up to about 2300 ft. west of the peak, but at that elevation I found only No. 17 with 42, along a permanent little springbrook, none of the large species having got so high up. Nos. 4 and 19a have been reported so far only from the northern part of San Mateo County, near the Fig. 1840 on the map, and No. 41 on rotten wood near Fig. 1315 close to the sea shore and northward.

On the west slope, north of Santa Cruz, No. 39 reaches Pescadero Creek and No. 35 to Purissima Creek, where I found very large ones near its source at an elevation of about 1000 ft. approaching in characters No. 26, while the rest of the Santa Cruz species continue into San Francisco County.

Thus we find in these two counties only 20 species and varieties, although the conditions seem so much more favorable than east of the bay, but may safely add to them Nos. 32, 40, 43, found in Santa Clara County, and doubtless entering the mountains of one or both of these.

The height 1840 ft. on the map refers to Mt. Montora, marked by a small circle west of the figure, (two summits there *not intended for towns*). The fig. 1315 is San Bruno Mountain, near the San Francisco boundary.

The addition of Santa Clara Valley, makes a region more similar in form and extent to that described east of the bay, but there are 11 forms found there not known westward, while only 3 occur westward, not found east. Probable reasons for this will be given later, after adding species found in the next county.

It must be remarked that the ledges of limestone are not so productive of land shells as the fossiliferous rocks, the former being so silicified as to be usually little soluble. One runs from Pt. Pedro southeast across the range at Black Mt. to the east base of Mt. Bache; another forms a wide belt around the south end of the spur west of San Lorenzo River.

San Francisco County.

Although only about six miles square and so long occupied by a dense population, this county shows natural advantages for the land pulmonates, superior to any around San Francisco Bay. These consist in its sub-insular position causing a very uniform cool climate, moisture from sea-fogs, and sufficient lime, supplied in part by the remains of marine animals in lately raised beaches, in part from the calcareous veins in the older sandstone. Even the drifting sands that formed arid hills over nearly half its western surface contain numerous fragments of sea shells and microscopic polyzoa, so that where vegetation could grow on them, land shells of all kinds flourished, aided by the dense summer fogs. Yet the higher hills, chiefly metamorphic, although having many rocks and trees to shelter them, show the same absence of these animals as elsewhere, No. 30 and varieties ascending only to about 400 ft. and No. 20 to about 900. I regret that I did not more carefully note the altitudes to which Limacoids ascend in any of the counties, but this could only be thoroughly done in winter, when the higher regions are not easily explored.

Although they were decimated by the domestic animals

of settlers for over twenty years, it was possible up to 1872 to find many species during a few hours' search in the moister and least cultivated spots west of the city, sometimes in quite large colonies, and yet hundreds of collectors were constantly picking them up. It is indeed astonishing that any species survived so long the numerous exterminating influences around them; but the fact shows what persistency they possess wherever the slight moisture from summer fogs assists in retaining their vitality, and above all has probably for ages prevented those desolating fires that killed everything where more luxuriant vegetation covers the soil, and hot dry summers cause fires to rage. For it is not only human destructiveness, or hunters' fires that do the damage, as friction of two dry branches by a gentle breeze, and even the sun's heat, magnified by passing through natural lenses of resinous gums, are believed to be among the causes of fires, even where lightning is scarce, and inflammable vapors may not be ignited by the sun.

That the great number found was not merely due to the many collectors at work, is shown by the scarcity of all the species in any similar extent of land in the neighboring counties; for while all those of the counties southward have been reported to be found except ten, we find added Nos. 15, 16, 18, 20, 24, which, with 1, 3, 5, 11, 12, 17, 19, 20, 21, 25, 26, 30, 31, 41, 42, 43, make twenty-one forms known in the county, to twenty-three in the three large counties next southward, and for the whole region west of San Francisco Bay a total of twenty-nine; while Nos. 14, 34, 37, 38, 39, 44, 45, are found only farther south, and Nos. 2, 7, 8, 14, 22 ?, 23, 28, 36, 37, 44, 45, occur on the east but not the west side of the bay. Of these, Nos. 7, 8, 14?, 28, 37, 44, 45, may be considered regional variations, due to climatic influences of analogous forms found on the west side, or, more strictly stated, the west side forms have varied from previously existing eastern forms.

There is a possibility that cultivation and preservation of

large tracts in parks, etc., well watered, and protected from other animals, may favor the increase of some or all of the species in this and other counties. I have known of Nos. 1, 3, 5, 16, 17, 21, 26, 30 and its varieties to be found in gardens, while 3 and 16 are imported species, always increasing with cultivation. East of the bay, Nos. 2, 20 and 21 have also been found in gardens.

Marin County.

This county, though lying partly west of the waters connected with San Francisco Bay, and only separated from the last by a narrow channel, differs so much that it is better grouped with those northward. Before visiting that region, I supposed that the mountains so prominent in that direction must be far better suited to produce land-pulmonates than the low sandy peninsula, or the drier and less wooded hills southward.

But while exploring Marin County very carefully, I found none at all on the east slope except near the base of Mount Tamalpais, on Angel Island, where a few only exist, and close to the marshy shores of San Pablo Bay, about Indian mounds or in thickets. Those known there, all quite scarce, are Nos. 1, 4 or 5, 6, 9 or 10, 11 or 12, 23, 30, 31, 42, 43. Connected with this scarcity, we find a new influence beginning to appear, in the occurrence along the northeast slope of the county, of volcanic rocks, as will be later mentioned more fully.

Most of this eastern slope consists of metamorphic rocks, thinly covered, and with little lime, while trees and shrubbery are found only in cañons or on rocky ridges. A few redwoods grow at the east base of Mount Tamalpais, while other coniferous trees occur about the summit, and more abundantly toward the north and west, where they give dense, damp shelter in some localities. Between Mount Tamalpais and Bolinas Bay the tertiary fossiliferous strata cover the west slope, and there are found Nos. 11, 25, 26, 36, be-

sides those last given. Of these I found only No. 11 up to 1200 feet elevation. The triangular peninsula, 1436 feet high, west of Tomales Bay, is chiefly of tertiary strata, but in parts granitic, with much sandy and marshy land about Drake's Bay, quite a dense coniferous forest covering much of its surface. Being also exposed to the sea breeze and fogs, it would seem better adapted for the pulmonates than San Francisco County, which has a similar extent, but so far few species have been brought from there. Along the easterly slope of the ridge a ledge of limestone is exposed, but I could not find any species near it, nor on the higher parts of the peninsula. From the west slope I have received varieties of No. 30, chiefly that often called "*Nickliniana*," which differs from No. 33 in a thicker shell, with a coarsely wrinkled surface, often blotched with whitish patches. This variation is caused by the influence of the spray from the ocean sprinkling the growing shells among the shrubbery just within the sand hills of the beach, where they are sometimes quite numerous, and the same effect is produced on several other species growing in similar situations all along the coast. From this, I infer, arose the reference of "*A. Nickliniana*" to San Diego, where a similar variety of *A. Kelletii* is found.

Marin County thus has only fifteen forms. This great diminution in number of species where conditions seem favorable for more, will be better understood after describing those of the remaining counties.

The figures along the sea coast give the heights of almost perpendicular rocky bluffs, which like the steep Farallone Islands, are chiefly of granite or hard metamorphic rock. Angel Island and all the others near the entrance of the bay, are also chiefly of this nature, and have furnished very few Pulmonata, but Mare Island is tertiary, and supplied more.

Sonoma County.

Little more than half of this is shown on the map, but

enough for present purposes. Near the boundary of Marin County some of the hills are only about three hundred feet in height, allowing the sea breeze to pass inland with almost as much force as at San Francisco Bay, and their desiccating effect in summer is shown by the absence of trees over most of the west slope as far north as the low depression extends. But a little north of Bodega Bay the tertiary sandstones begin to extend over the metamorphic rocks farther inland, rise higher, and accompanied by a dense forest of redwood, etc., soon covering almost the whole surface of the country near Russian River. The fossils are numerous in this sandstone in many places, being as late as the pliocene epoch along Mark West Creek, twenty-five miles inland. The pulmonates of Marin County here become more numerous, extending north throughout the whole width of Sonoma County (excepting limited portions of metamorphic rocks), with increase of numbers, size and perfection. Nos. 10, 27, 29, are apparently varieties produced by improved conditions, especially increase of moisture, lime, shelter, and vegetation suited to their natures. There is no doubt that close search would reveal many others of the bay list there, if not new forms, the smaller kinds being slowly discovered. Among them, No. 23 is likely to be found living.

Fort Ross, in the northwest corner of the map, is the locality where Nuttall obtained some of the types, wrongly credited to San Diego.

Napa County.

The first appearance of volcanic rocks in any great amount has been mentioned as occurring on the northeast slope of Marin County, and they reappear in abundance on Sonoma Mountain, marked 2292 feet high on the map, thence continuing to form most of the mountain ridge which divides that county from Napa, and covering most of Napa County, extend northwest along the boundary between Lake and Mendocino Counties. Though not active in recent times,

there are many old craters on this ridge, the first one met with being Mount St. Helena, of which the summit is nine miles north of the map, on the north boundary of Napa County. There are, however, numerous sulphur and hot springs, which show that the volcanic forces have not yet died out, and the region covered more or less by volcanic materials extends entirely across the ridge west of Napa Creek, and over most of that east of it, as far at least as the heads of streams running into the Sacramento basin. We thus have a region about twenty-five miles wide of volcanic materials, alternating with tertiary deposits containing fossil wood, lignite and other terrestrial products, but no fossil shells yet known. Lime is therefore scarce, and the still heated mineral waters show that during the deposition of these strata animal or vegetable life must have been interrupted as far as the volcanic influence extended, either by flows of lava, hot water or ashes, until the quaternary epoch.

I explored Sonoma Mountain, the head of Napa Valley, and the whole shore of Clear Lake, finding very few land pulmonates, though six aquatic forms inhabit the lake, as well as six non-pulmonate mollusca, while some are also found in several of the creeks of the region, but much fewer than we might expect. This may be considered further proof that these streams have been not long ago heated or mineralized enough to destroy mollusca. Of land species, I can only mention Nos. 1, 4 (or 5), 9 (or 10), 43, 45, as certainly found in the volcanic region, most of which require scarcely any lime, and the two last are almost aquatic.

East of this region we find the foothills forming the east slope of the Coast range, about the headwaters of Putah Creek, composed of cretaceous and tertiary rocks containing fossils, and here are again found, forty-five miles inland, some of the land shells of the west slope, which, with the extensive and luxuriant forest covering much of the country, indicates that the climate is much less arid than along the

tertiary east slope south of the great rivers. I did not reach that region on the geological survey, but Dr. Yates found there Nos. 11, 25, 36, 37 in considerable numbers, and *Nó.* 37 also along the outlet of Clear Lake near lat. 39° , where it cuts through the same fossiliferous strata, although not existing around the lake itself. Here we have almost certain proof that No. 37 is not a variety of 36, both living together unchanged. Fig. 2224 is the highest point on the southeast boundary, at the angle west of the figures.

Solano County.

A volcanic ridge runs north, from west of Suisun Creek into Napa County, but the rest of Solano is of cretaceous and tertiary strata containing fossils, excepting the plain sloping eastward from about two hundred feet elevation to the marshes, where only Limacoid and Succinoid species are known to exist.

Mare Island, of pliocene formation, containing bones of land quadrupeds, is the most northern and western known locality of No. 32. No. 25 occurs near there, and Nos. 44 and 45 are to be looked for as in Contra Costa near the marshes, from Suisun Creek eastward. No. 14, first found in Trinity County, must be expected there, also some of the northern forms that occur westward. Small varieties of Nos. 26 and 30 have been found near the borders of Napa County, as in Contra Costa County, but not along any streams of the Sacramento basin.

GEOLOGICAL AND BIOLOGICAL DEDUCTIONS.

I. The marine pliocene fossils found along Mark West Creek, Sonoma County, in San Mateo County, Pajaro Valley, and northeast of Mount Diablo, now elevated at all these points about 300 feet above the sea, show that Marin County, San Francisco County, and the Santa Cruz Mountains, once formed islands 300 feet or more lower in the

ocean than now, and the Mount Diablo range, if not an archipelago, was nearly surrounded by water. In this, great beds of pliocene gravels, containing remains of land animals, were deposited by the streams running from the Mount Hamilton range, while Livermore Valley probably contained a large lake, discharging through Walnut Creek, before the present Alameda Creek cut through the western hills. Fossil fresh water shells found along branches of Walnut Creek both east and west, near Mission Peak, etc., show that lakes or marshes were extensive in pliocene and quaternary times.

II. No extinct land-pulmonata have been found with these fresh water forms (of which several are extinct), but in later beds on Walnut Creek, containing living fresh water forms, are two living land species, Nos. 32 and 33, showing that they were the first of the group to appear in the center of the range they now inhabit east of the Bay. These fossils are plainly quaternary, and the living shells of these two forms become more or less graded into 30, 31, 35, etc., toward the west and south, indicating probably that they may have been the original stock from which the latter were derived. From Marin County a specimen of No. 35 (?) has been brought in a fossil state, unlike those now living southward, being the only evidence known of any fossil forms north of the bay.

III. These few evidences show that the forms of the most characteristic group occurring in the bay region, the *Ariontæ*, are either indigenous, or derived from the coast range northward, and have colonized the region during the quaternary epoch, no preceding extinct forms having been discovered there, and no evidence of a transition direct from the Sierra Nevada.

IV. The species given in the table as found also in the Sierras, are, 1st, Limacoid, and therefore easily carried by floods without injury; 2d, Vitrinoid, mostly very small, and

supposed to have their eggs transported by adhesion to the feet of birds, although No. 11 may, as before remarked, have spread independently along the two ranges from the north; 3d, Nos. 24 and 25 (?), which may have been spread like the Vitrinoid species; 4th, No. 40, probably in the same way; 5th, Nos. 42 to 45, which may be spread by birds, or, being semi-aquatic, by aid of floods.

V. Considering that none of the Helicoid species are found above 1000 feet east of, and 1400 feet west of the bay, and that they could spread only by crawling (except when shells or eggs were washed *downward* for short distances without injury), we must conclude that they reached the shores of the region by floods chiefly from the north, and landed at heights between the present sea-level and the elevations just given. As they can ascend with more difficulty than Limacoids, they go less high up, and five hundred feet ascent is a liberal allowance for them to have climbed in any numbers. Subtracting this from their highest known ranges, we may assume that they reached the east side of the bay when the land was five hundred feet lower than now, the sea-shore being about two hundred and fifty feet above the fossil bed of Walnut Creek, and as the land rose, gradually spread downward into the valleys, and upward on the hills. Those of the Santa Cruz range would then have colonized that side when it was nine hundred feet lower than now, which may have been about the same period, as the more western range has probably risen more in the same length of time than the eastern, and the whole elevation has been during quaternary times.

VI. The much less abundance and limited diffusion of the species known from the counties north of the bay, within the limits of the map, in spite of the moister and cooler climate, can only be explained by the influence of volcanic forces there, and scarcity of lime along the central ridge of the coast mountains. The twenty-one

forms known there, favored by climate, have extended themselves farther eastward than south of the "Golden Gate," and several large kinds are found east of the volcanic belt, that probably reached there before the last period of volcanic activity buried the "fossil forest," and much life with it. The occurrence of a few species throughout the volcanic region, and of several others at points near its borders, shows that Limacoids spread most rapidly over it, and those with thin shells next, while the large Helicoids were last to obtain a foothold on it.

VII. While it might be supposed that Nos. 30 to 35 could have more easily reached the Bay region from the southward, on account of the courses of most of the present streams, there is no fossil evidence that they ever existed in that direction south of Monterey Bay; while Nos. 26 to 30, and 36, still have their living allies toward the north. That they spread southward at different periods seems also proved by the various distances they have reached, and by the few fossils known.

VIII. Thus we do not find that No. 36 was ever able to cross the salt waters of the Golden Gate to San Francisco County, but can easily believe that it could have been washed down Suisun Creek and across the strait during the winter floods, landing nearly opposite Mare Island, and thence spreading along the moist western slope of the hills to its present terminus, thirty-six miles southward. That it is a very late colonist there, is also proved by its not having been carried across Santa Clara Valley to the Santa Cruz Mountains, which are better suited for it, while most of the forms of 26 and 30 seem to have drifted over there, and flourished more generally than on the east side. The five or six Helicoid forms out of the twenty-one found in San Francisco County probably reached there in that way, the others coming in the general modes before mentioned. Had they been carried there by floods from the large rivers

they would probably have landed as often on the north shore of the Golden Gate, and become as plenty in the cool damp localities on the west side of Marin County, and more common on the islands of the Bay.

IX. The migration of No. 36 being thus explained, and the general course of distribution of other Helicoids indicated, we can now see how No. 37 may be derived from *C. traskii* by a migration from the Sierra Nevada, but in an opposite direction. The sketch of the distribution of *C. traskii* given on pps. 361 to 364 shows that it intergrades with No. 38 on the coast southward, which may sufficiently account for the origin and range northward of 38 and 39, as they cannot be traced to any form now living within 500 miles north of No. 39. By a quicker route *C. traskii* might have easily been washed down the San Joaquin Valley to the east slope of the coast mountains almost anywhere, but did not find a suitable region for increase until reaching the gap of the Bay region. Any of them landing on the north shores of the strait would ascend along the banks of streams and thus spread to their present northern limit about 50 miles north of the Bay, but have not crossed the volcanic belt to the west side of the Coast range. South of the straits we also find that they have not gone west of the figure 485 in Alameda County, though an allied form reaches Salinas River from the southward. This seems a more natural mode of distribution for this form than that before suggested. Here again the present location of its nearest allies points to its origin, while on the other hand that of the *Ariontae* is as plainly traceable to the northern coast ranges instead of the Sierra Nevada. The species found there could apparently be as easily washed down, but seems not to have become colonized.

X. Although there is such a general resemblance in form between Nos. 32 and 37 that Mr. Binney has considered them closely related and mixed them in his figures, I con-

sider this as merely analogical, caused by the general law before stated, that the varieties of each group are more depressed and umbilicate the farther from the coast. Thus we find No. 32 passing into higher forms of 30 to the west, and one variety between 30 and 31 is imperforate though depressed. In the same way *C. traskii* and 37 pass into 38 and 39 near Monterey bay.

A similar effect of climate is observed in the passage of No. 28 toward 26, 27, and 29, in the cooler moister regions west and north, and perhaps into 35 southward. The varieties 30 to 34 seem to have diverged from 33 (or 32) east of the bay, though 30 and 34 are now more abundant on the west side. No. 41 seems also the coast form of No. 40. On the other hand No. 6 may have varied into 7 and 8, which are not known westward. No. 11 seems to have changed into 13 and 14 toward the dry east and south slopes, while 36 has before been traced by intergrades to *C. fidelis*, the northern form as old as miocene times.

XI. The greater extent of both salt and fresh waters through the Bay region, in early quaternary times, no doubt caused a more moist and uniform climate to prevail throughout the Bay region, and was more favorable to the growth and diffusion of Pulmonata than the present epoch. Then the conditions were similar around Livermore Valley to those of Monterey now, and to this I attribute the existence there of No. 34, a few of which still survive toward Cedar Mountain.

XII. In the article on the "Influence of Climate and Topography on our Trees," (Proc. Cal. Acad. V. 285, 1874), relating to the same region included in the map now given, I showed that very few species occurred in San Francisco County, while they increase in numbers of both species and individuals up to 60 miles in nearly all directions. This was attributed to the violence of the summer winds near the

bay, causing too rapid desiccation of the surface to allow of the growth of seedlings, and favoring destructive fires.

It now seems that the effects of the winds in the lower parts of the Bay region, except so far as they spread fires in the forests, are an advantage to pulmonates, which have always been most numerous nearest to the entrance of the bay. This does not, however, prove that they are independent of forests, for these furnish them with shelter and food more abundantly than where no trees exist, so that the finest specimens are found in the forests, though perhaps less frequent, or harder to find. There is also a connection between certain forms and certain groups of trees, as I stated in the synopsis, (*Proc. Cal. Acad.*, III., 260 and 336-7, 1866).

XIII. That the Bay region is, from physical configuration, the best suited for commerce, and a large population, of any on the coast, is a coincidence that may be favorable to the increase of land pulmonates. We find already that three species have become naturalized (though not desirable additions) and the protection from fires, irrigation in summer, cultivation of trees, and destruction of many native enemies, such as carnivorous quadrupeds and some birds, may balance the injuries from cultivation. Some kinds are indeed so numerous already as to be troublesome, especially the Limacoids, in gardens near wet grounds.

XIV. The great difference in distribution of species near the bays from that in the Sierra Nevada may now be explained.

1st. The Sierra having been elevated probably before the tertiary epoch (though no terrestrial fossils yet prove it), was a high range before the miocene land shells of Oregon existed, and they extended over it at an elevation between 1000 and 5000 feet of its present height.

2d. It has continued to rise during the tertiary epoch and since, so that we find the large Helicoids dwarfed at

5000 to 5500 feet elevation, though the degree of cold there has not destroyed them.

3d. The great differences of climate in different zones of the Sierra, cause more distinct limitation of species by different elevations than in the coast range near the sea shore, but as shown by the distribution of *C. traskii* and varieties, it is less apparent at a distance from the Bay region, both northward and southward, where the two ranges of mountains are crowded together. Toward the coast, every group becomes more varied into sub-species, and larger colonies of most of them are found.

4th. The more equable and moister climate near the coast evidently makes it possible for many forms to live together that are more or less limited on the Sierra Nevada to special zones, and this is most apparent nearest to the seashore.

There is an approach in the Santa Cruz range to a higher zone of Vitrinoids and probably of Limacoids. The latter are found, like the Succineas, in the Sierra, both at their base, in damp grounds, and at nearly 6000 feet altitude, though rare between.

XV. To give a practical point to this long article, it may be remarked, that, although the ancient practice of feeding human pulmonates on Helicoid pulmonates as a cure for lung diseases has been justly abandoned (marine mollusca being far preferable), yet they are still much sought for by European epicures, as great delicacies, and may be worth cultivation for this purpose.

It may be added that the search for them in the groves around the bays has been found by the writer one of the most beneficial modes of exercise in his own experience, when threatened with pulmonary consumption. Thus they may benefit health without internal use, and make outdoor exercise more interesting to those who need it, than if taken without any other purpose than to gain strength.

THE FLORA OF THE COAST ISLANDS OF CALIFORNIA IN RELATION TO RECENT CHANGES OF PHYSICAL GEOGRAPHY.

BY JOSEPH LE CONTE.

Read September 5, 1887.

Some of the results reached by Mr. E. L. Greene in his studies of the flora of the islands off the coast of Southern California* have deeply interested me, because I believe their explanation may be found in geologically recent changes in the physical geography of California.

These remarkable islands, 8 or 10 in number, are strung along the coast from Point Concepcion southward, and separated from the mainland by a sound 20—30 miles wide. They are of considerable size (the largest being about 200 square miles in extent), and vary in height from 1,000 to 3,000 feet. They have all the characteristics of continental islands, and are undoubtedly outliers of the mainland, at one time connected with it, but now separated by subsidence of the continental margin. They may be regarded as the highest points of the old coast range outside of the present coast range, the broad valley between the two being now covered with water. Moreover, the date of the separation may be determined with certainty. That they were connected with the mainland during the later Pliocene and early Quaternary is proved by the fact that remains of the mammoth have been found on Santa Rosa, the largest and one of the farthest off of them.† *They were, therefore, undoubtedly separated during the Quaternary Period.*

The main points in Mr. Greene's paper with which we are here concerned are the following:

*Studies in the Botany of California and Parts Adjacent, VI. E. L. Greene. 1—Notes on the Botany of Santa Cruz Island. Bull. 7 Cal. Acad. Sci.

†Proc. Cal. Acad. of Sci. vol. V., 152.

1. Out of 296 species of plants collected by him on the island of Santa Cruz, no less than 48 are entirely peculiar to these islands, and 28 peculiar to Santa Cruz itself.

2. Of the remaining 248 species nearly all are *distinctively Californian*—that is, species peculiar to California are very abundant, while common American species, *i. e.*, those common to California and other parts of North America, are very few and rare. The flora as a whole, therefore, may be regarded as *distinctively Californian*, with the addition of a large number of species wholly peculiar to the islands.

3. A number of rare species found in isolated patches, and, as it were, struggling for existence, in the southern counties—San Diego and San Bernardino—are found in *great abundance and very thriving condition on the islands*.

4. *Lavatera*, a remarkable malvaceous genus of which 18 species are known in the Mediterranean region, and one from Australia, but *not a single species on the American Continent*, is represented on these islands by four species. This is certainly a most remarkable and significant fact.

Such are the facts. I account for them as follows:

California, especially the region west of the Sierra Nevada, is geologically very recent. The Sierra region was reclaimed from the sea at the beginning of the Cretaceous, and the coast region as late as the beginning of the Pliocene. When first emerged the coast region was of course colonized from adjacent parts. This colonization was probably mainly from Mexico, either directly or through the Sierra region; for the *distinctively Californian* plants, though peculiar, are more like those of Mexico than any other. Whencesoever it may have been colonized, however, the environment was sufficiently peculiar, the isolation sufficiently complete, and the time has been sufficiently long to make a very distinct flora.

According to Wallace, it is one of the primary divisions of the Nearctic Region.

During the late Pliocene and early Quaternary, as already seen, the islands were still a part of the mainland, and the whole was occupied by the same flora, viz: the distinctively Californian (with some differences doubtless), now found in both, together with the peculiar island-species.

During the oscillations of the Quaternary the then westernmost coast range was separated by subsidence, and has remained ever since as islands. Simultaneously with, or after, this separation, came the invasion of northern species, driven southward by glacial cold. Then followed the mingling of invaders with the natives, the struggle for mastery, the extermination of many (viz: the peculiar island species), and perhaps the slight modification of all, and the final result is the California flora of to-day. But the island flora was saved from this invasion by isolation, and therefore far less changed than the flora of the mainland, *i. e.*, the invading species are mostly wanting, and many species survived there which were destroyed, or else modified into other species, on the mainland, and the remainder probably less modified than on the mainland. The flora of these islands, therefore, represents somewhat nearly the character of the flora of the whole country during the Pliocene times. Some modification they have doubtless suffered, but the time has been too short for any great change in the absence of severe competition.

The question naturally arises, "How is it that with a separation of only 20—30 miles the two floras—insular and mainland—have not become entirely similar by mutual colonization?" The prevailing winds being landward would, I suppose, largely prevent the colonization of common American forms on the islands, although some such colonization has in fact taken place. But with the prevailing winds in this direction, why have not all the peculiar island species been long ago colonized on the mainland? Accord-

ing to the view above presented the answer is evident. These peculiar species did once inhabit the mainland and have been either destroyed or transformed in the struggle with invaders. They are therefore *weaker* species. The same unfitness which made them succumb then, still forbids their successful colonization. This brings me to the next point.

There are quite a number of rare and peculiar forms found struggling for existence in the southern counties which are found very abundant on the islands. This certainly looks like the beginnings of colonization. This is indeed Mr. Greene's view, and is rendered all the more probable by the fact that the ocean currents probably drift in that direction. But there is at least another explanation suggested by the view above presented. These may be, and probably are, *remnants* of Pliocene indigenes still undestroyed, but ready to perish. From this point of view their place far south is just what we might expect, for the main invasion was from the north.

But there is still a last point to be explained. *Lavateras* are unknown in the New World, except on these islands, where there are four species. But they are found in the Old World, in the Mediterranean region and in Australia. Mr. Greene suggests, as a possible explanation, *a former connection of these islands with some other continent*. I think not. The substantial permanence of continental land masses and oceanic basins, with only marginal changes, at least during later geological times—taken together with the comparative recency of the flora of California—renders this explanation extremely improbable. The above presented view suggests another and far more probable explanation.

The existence of *Lavateras* in such widely separated localities as Australia, the Mediterranean region and the coast islands of California, shows unmistakably that existing species are but remnants of an old, once very abundant and widely spread genus, with numerous species. They are now

dying out. They have been mostly destroyed and replaced by newer and stronger forms. I conclude, therefore, that in Pliocene times several species of *Lavatera* existed all over the coast region of California, but probably mostly in the then coast range, viz: the islands; for they love the sea coast. They have all been destroyed by change of environment, physical and organic, except those isolated on the islands and thus saved from the effects of invasion.

Readers of Mr. Wallace's "Island Life" will at once see the analogy between this explanation of the flora of our coast islands and Mr. Wallace's explanation of the mammalian fauna of Madagascar. The mammalian fauna of Africa, south of Sahara, consists of two very distinct groups—the one *indigenous* or descendants of Tertiary indigenes, and *remotely* resembling that of Madagascar, the other evidently *foreign* and resembling that of *Eurasia in Miocene and Pliocene times*. During Tertiary times Africa was isolated from Eurasia, but united with Madagascar, and the whole inhabited by a peculiar fauna, characterized by lemurs, insectivores, etc., which we have called indigenes. About middle Tertiary times, Madagascar was separated; and immediately divergence between the two faunas commenced. In later Tertiary and early Quaternary, the barrier which separated Africa from Eurasia was removed, and the great Eurasian animals invaded Africa, and immediately became the dominant type. In the struggle which ensued, many species, especially of the weaker indigenes, were destroyed, and all on both sides modified. The result is the African fauna of to-day. Madagascar was saved from this invasion by isolation. The fauna there consists of the greatly modified descendants of the African Tertiary indigenes, but far less modified than their congeners in Africa. In the fauna of Madagascar, therefore, we have the nearest approach to the Tertiary indigenes of both.

The difference between the two cases is this: In the case of Madagascar the separation has been very long. The

extreme peculiarity of its fauna is the result partly of progressive *divergence* and partly of *many forms saved by isolation*. In the case of the coast islands of California, the separation is comparatively recent—there has not been time enough for very great divergence by modification. The peculiarity of its flora is due almost wholly to species saved by isolation.

In conclusion I would say, that this short paper is intended merely as an incentive to future investigation and pointing in the direction which it ought to take. Before the views above presented can be definitely established, there must be further investigations, first, on the relation of the island flora to that of the mainland; second, on the relation of the flora of California to that of adjacent points from which it may have been originally colonized; third, and especially, must we have fuller knowledge of the indigenous flora of California in Pliocene times.

PRIORITY OF DR. KELLOGG'S GENUS MARAH OVER
MEGARRHIZA Torr.

BY MARY K. CURRAN.

A recent paper* by Mr. Watson, in which he reaffirms the genus *Megarrhiza* Torr., renders necessary the following statement of the date and circumstances of publication of the first volume of the Proceedings of this Society, more especially as silence on our part would do injury to our venerable pioneer botanist recently dead.

That the eminent author of the above paper has been misled by the ambiguous language of some of our publications is quite possible; his own is however equally so, for as will be noticed, although seeming to deny the priority of *Marah*, he does not specifically do so, and fails to give reasons for his preference of *Megarrhiza*.

Mr. Watson says :

“In the years 1854 and 1855 the same plant and similar Californian species were collected by the botanists of the Pacific Railroad surveys, and specimens were submitted to Dr. Torrey for determination. Some of these species were also known to Dr. Kellogg, of San Francisco, and in March, 1855, he described one of them under the name *Marah muricatus*, noting at the same time its near relationship to *Echinocystis lobata*. In June, however, of the same year, he appears to have silently discarded or to have forgotten his new genus, for he then describes another species of the

*The Genera *Echinocystis*, *Megarrhiza* and *Echinopepon*: Sereno Watson. Bull. Torr. Club. XIV. 155. August, 1887.

'giant root' as *Echinocystis muricatus*. These publications were made in the columns of a daily newspaper. Dr. Torrey, in ignorance of this and as a result of his study of the Government collections made under Lieutenants Whipple, Parke and Williamson, referred the plants to a new genus which he called *Megarrhiza*, publishing a species (*M. Californica*) in Parke's report in 1856 and authorizing the enumeration of that species and of *M. Oregana* in Newberry's report upon Williamson's plants. The descriptions of the genus and species he delayed, intending to give them in full in connection with his report upon the collections made by Lieut. Whipple. The publication of this report, however, was not made until 1857, and in the meantime he learned through Dr. Andrews of Kellogg's genus *Marah*. Consequently, and more especially on account of the difficulty of determining, from the scarcity of the materials, whether there was really more than one species, he omitted from the report all reference to the matter, and nothing more was published by him on the subject. Nevertheless, the genus *Megarrhiza* was recognized by Dr. Gray in 1859, in his list of Xantus' Lower California plants, and in 1860, in the Botany of Ives' Report."

In the above account it will be observed that the author ignores the publication of *Marah* in Proc. Cal. Acad., I, 38, which was not later than April, 1855. An error of this kind can only be explained by supposing that Mr. Watson had never seen the first edition, of which only 250 copies were issued, nor read the preface to the reprint.

The publication of the Proceedings of the California Academy of Sciences was begun in September, 1854. Vol. I was reprinted in 1876, and in the preface the editor, Prof. R. E. C. Stearns, now of the Smithsonian Institution, says:

"The Proceedings of the California Academy of Natural Sciences for the period included in this volume, were originally printed in a newspaper called *The Pacific*, published

in San Francisco; the columns were afterward re-arranged, with but little regard for uniformity and size into double-column pages approximating to octavo, and printed four pages to a signature."

The exact date of issue of these folio sheets cannot now be determined, but it was certainly in each case less than a month after the meeting reported. The limited font of a weekly paper of that time would not admit of the withdrawal of much type locked up in galleys. Most of the early folios bear the signature date, which is at any rate approximately correct.

Scattered through the minutes of this Society in 1854-1855 are brief notes recording the issue of these signatures, and on February 5, 1885, a letter was received from the Imperial Academy of Sciences at Berlin acknowledging the receipt of the first, so that it is probable that the large societies of Europe are better informed concerning this question of priority than our friends at home.

A full list of the plants described by Dr. Kellogg with their dates and media of publication is to be found in Bull. Cal. Acad., Vol. I, 128. In that paper it was taken for granted that the date of publication of the volumes of our Proceedings was sufficiently well known. This would seem from Mr. Watson's paper to have been, at least in his case, a mistake.

As to the statement that Dr. Kellogg gave up his genus *Marah* when he published *Echinocystis muricatus*, the fact of his using the same specific name for the second plant is conclusive evidence that he considered them generically distinct, and if further proof were needed it is furnished by his publication of *Marah minima* four years later. This is, however, a matter of small consequence, as the prevailing opinion of biologists seems to be that over a name once published the author has no more rights than any other person.

Into the question of sufficiency of a weekly, not "daily," newspaper as a medium of publication, or the validity of *Marah* as a genus distinct from *Echinocystis*, it is not now necessary to enter; they have been already treated by pens far abler than mine.

INDEX.

- Ababactus* 38, 209, 211, 228, 230
 nactus 230
 pallidiceps 209, 230
Abronia crux-maltæ 444
 maritima 411
 umbellata 411
Accipiter Cooperi 421
 velox 420, 426
Acer macrophyllum 393
Achillea millefolium 404
Achyrochæna mollis 403
Actidium 248
 rotundicolle 166, 248
Actium 201, 472
 californicum 455, 476
 pallidum 456, 472, 473, 482
 politum 456, 473
 robustum 456, 474, 476
 testaceum 456, 475, 476
Adenostoma fasciculatum 397
Aderocharis 229, 232
Adiantum capillus-veneris 415
 pedatum 415
Ecidium 441, 442
 abundans 440
 calystegiæ 441
 euphorbiæ 440
 phaceliæ 440
 ræstelioides 440
Ægialitis vocifera 425
Agelaius gubernator 428
 tricolor 428
Aglenus brunneus 262
Agropyrum repens 415
Alexia 355
Alders, Pacific Coast 351
Allium lacteum 129, 142
 Tilingi 129, 142
Alnus incana, var. *viridescens* 351
 maritima 351
 oblongifolia 351, 352, 354
 rhombifolia 351, 352, 354
 rubra 351, 353
Amarantus albus 411
Amauronyx Maerkeli 197
Amblyopappus pusillus 404
Ambrosia psilostachya 402
Ammodramus sandwichensis alaudinus 422, 429
Ampelis cedrorum 305
Amphichroum 235
 alutaceum 236, 241
 crassicorne 239, 241
 flavicorne 235, 240
 floribundum 236, 240
 lævicolle 240
 maculatum 240
 opaculum 241
 pilosellum 237, 241
 puberulum 241
 scutatum 240
 sparsum 240
 testaceum 240
 veterator 238, 240, 241
Amphispiza belli 429
Amsinckia intermedia 407
 lycopsoides 407
Anacalais 50
Androsophium 129
Anisophyllum 56
Anser albifrons gambeli 279
Anthostomella perfidiosa 445
Anthribus albinus 66
Anthus pensilvanicus 307
Antirrhinum Nuttallianum 408
 strictum 409
Aphanocalais 45
Aphelocoma californica 422, 427
Aphyllon tuberosum 409
Apiastrum angustifolium 399
Aplopappus squarrosus 400
Apocellus 232
 brevipennis 234
 niger 232
Aquila chrysaetus 421
Archibuteo ferrugineus 421
Arctostaphylos 483, 488
 Andersoni 486, 490
 bicolor 496
 diversifolia 406
 glauca 484, 495
 Hookeri 490
 insularis 494
 manzanita 484, 491
 Nevadensis 490
 Pringlei 491, 494
 var. *drupacea* 495
 pumila 488, 489

<i>Arctostaphylos pungens</i>	406, 484, 495	<i>Batrissus</i>	173, 459
<i>Stanfordiana</i>	465, 493	<i>albionicus</i>	173
<i>tomentosa</i>	406, 490	<i>cephalotes</i>	456, 459, 463
<i>viscida</i>	484, 492	<i>denticollis</i>	460, 461
<i>uva-ursi</i>	483, 488, 489	<i>formicarius</i>	174
<i>Arabis filifolia</i>	390	<i>foveicornis</i>	456, 462
<i>Arbutus pungens</i>	490	<i>luculentus</i>	456, 460
<i>Argemone corymbosa</i>	59	<i>mendocino</i>	174
<i>Ariolimax californicus</i>	367	<i>monticola</i>	177
<i>columbianus</i>	367	<i>occiduus</i>	178
<i>niger</i>	367	<i>punctifrons</i>	456, 463
<i>andersonii</i>	367	<i>speculum</i>	176
<i>bemphilli</i>	367	<i>spretus</i>	463
<i>Arintia arrosa</i>	367	<i>zephyrinus</i>	175, 455
<i>arboretorum</i>	367	<i>Behria</i>	143
<i>holderiana</i>	367	<i>tenuiflora</i>	143
<i>stiversiana</i>	367	<i>Berula angustifolia</i>	399
<i>californiensis</i>	367	<i>Bigelovia veneta</i>	400
<i>bridgesii</i>	367	<i>var. sedoides</i>	400
<i>exarata</i>	367	<i>Binneya notabilis</i>	361
<i>nemorivaga</i>	367	<i>Biotis</i>	456
<i>ramentosa</i>	367	<i>formicarius</i>	456, 482
<i>vincta</i>	367	<i>Blackbird, bicolored</i>	428
<i>Artemisia Californica</i>	404	<i>Brewer's</i>	422, 428, 453
<i>Ludoviciana</i>	404	<i>tricolored</i>	428
<i>Arthrodesmus convergens</i>	434	<i>yellow-headed</i>	428
<i>ovalis</i>	434	<i>Bluebird, mountain</i>	272, 318, 431
<i>subulatus</i>	434	<i>western</i>	424, 431
<i>Ascochyta Fremontiae</i>	439	<i>Bloomeria</i>	129
<i>Asemum nitidum</i>	70	<i>aurea</i>	413
<i>Aspidium</i>	416	<i>Bolitochara</i>	250
<i>munitum</i>	415	<i>Bolitophagus</i>	254
<i>rigidum</i>	415	<i>Botany of California and Parts adjacent</i> — <i>Studies in</i>	125, 377
<i>Aster radulinus</i>	401	<i>Botany of Santa Cruz Island</i>	377
<i>Astragalus didymocarpus</i>	395	<i>Brachytarsus scabrosus</i>	66
<i>leucopsis</i>	395	<i>Bradycinetes</i>	61
<i>Athysanus pusillus</i>	390	<i>Hornii</i>	61
<i>Atriplex Breweri</i>	411	<i>Brassica nigra</i>	390
<i>californica</i>	411	<i>Brevoortia</i>	129
<i>leucophylla</i>	411	<i>Brickellia Californica</i>	400
<i>microcarpa</i>	411	<i>Brodiaea</i> — <i>Genera confused under the</i> <i>name of</i>	125
<i>Audibertia Palmeri</i>	410	<i>californica</i>	125, 126, 127, 130
<i>Autalia</i>	204	<i>capitata</i>	133, 134, 135
<i>elegans</i>	204	<i>congesta</i>	131, 132, 133, 134, 135
<i>Avena fatua</i>	415	<i>grandiflora</i>	136
<i>Baccharis consanguinea</i>	401	<i>insularis</i>	134, 413
<i>Douglasii</i>	402	<i>multiflora</i>	132
<i>Plummeræ</i>	401	<i>parviflora</i>	132
<i>viminea</i>	402	<i>pulchella</i>	133
<i>Bæria Burkei</i>	151	<i>volubilis</i>	130, 132
<i>Palmeri, var. Clementina</i>	403	<i>Bromus</i> ———.....	415
<i>Bambusina Brebissonii</i>	432		
<i>Barinus</i>	255		
<i>squamolineatus</i>	256		

Bryaxis.....	179, 181, 182, 183, 465	Ceanothus crassifolius.....	393
arizonæ.....	456, 465	Centaurea melitensis.....	405
infinita.....	184	Cerambycidae.....	70
texana.....	183, 466, 482	<i>Cerasus occidentalis</i>	396
Bubo virginianus subarcticus.....	421, 426	Chaetophleus hystrix.....	259
Bunting, lazuli.....	429	Chamaea fasciata.....	431
Bush-Tit, californian.....	424, 431	Cheilanthes Californicus.....	415
Buteo borealis calurus.....	279, 421, 426	Chenopodium ambrosioides.....	411
Byrrhidae.....	166	album.....	411
Calais.....	45, 48	californicum.....	411
Clevelandi.....	153	murale.....	411
graciloba.....	54	Chickadee, mountain.....	424
Kelloggii.....	49	Chondestes grammacus strigatus.....	422, 429
Lindleyi.....	48, 49	Chordeiles virginianus henryi.....	426
linearifolia.....	48, 405	Chorizanthe staticoides.....	411
macrochaeta.....	49	Chrysomelidae.....	67
Parryi.....	49, 153	Clarkia elegans.....	398
plurisetæ.....	405	Claytonia perfoliata.....	392
Calandrinia Menziesii.....	392	Clematis ligusticifolia.....	388
Callipepla californica.....	425, 452	Cleridae.....	71
vallicola.....	420	Closterium acerosum.....	432
Calliprora.....	139	Dianæ.....	432
Calocalais.....	48	parvulum.....	432
Calochortus ———.....	413	prunum.....	432
Caloderma.....	3, 5, 38, 229, 230	rostratum.....	432
angulatum.....	7	setaceum.....	432
contingens.....	6	Cnicus fontinalis.....	151
contractum.....	9, 10, 11	lilacinus.....	404
luculentum.....	10	neglectus.....	404
mobile.....	8	Coccothraustes vespertina.....	449
reductum.....	11	Colaptes cafer 288, 289, 290, 291, 421, 426, 452	
rugosum.....	5, 7	rufipileus.....	273, 285, 288, 289, 290, 291
tantillum.....	12	Coleoptera, larval history of.....	64
Campylæa dupetithouarsi.....	367	N. A. Descriptive notices of.....	157
sequoicola.....	367	New species of.....	61
fidelis infumata.....	367	Colusa.....	259, 260
traskii diabloensis.....	367	Comarostaphylis diversifolia.....	386, 406
Campylorhynchus brunneicapillus.....	430	Compositæ, cichoriaceous.....	41
Capsella bursa-pastoris.....	390	Conferva?.....	437
divaricata.....	390	Conium maculatum.....	399
Caracara, Guadalupe.....	281	Conulus fulvus.....	359
Cardamine filifolia.....	390	Convolvulus arvensis.....	408
integrifolia.....	389	Binghamiæ.....	417, 418
Nuttallii.....	389	luteolus.....	417, 418, 441
oligosperma.....	390	macrostegius.....	408
paucisecta.....	389	occidentalis.....	417, 418
Carex.....	414	sepium.....	417, 418
angustata.....	414	villosus.....	441
Carpodacus amplus.....	293	Conyza Coulteri.....	401
frontalis rhodocolpus.....	422, 428, 453	Corethrogyne filaginifolia.....	401
Castilleja affinis.....	409	Corvus americanus.....	422
hololeuca.....	409	Cosmarium aculeatum.....	432
Cathartes aurea.....	420	amœnum.....	432
Ceanothus arboreus.....	144, 393	bioculatum.....	432

Cosmariium Brebissonii.....	433	Diatrypella prominens.....	444
contractum.....	433	<i>Dichlostemma</i>	127, 130, 132
crenatum.....	433	<i>Californicum</i>	131
cucumis.....	433	Diplacus arachnoideus	409
exiguum.....	433	parviflorus	409
margaritiferrum.....	433	Diplodia frangulæ.....	439
meneghinii.....	433	nerii	439
moniliforme.....	433	profusa.....	439
nitidulum.....	433	Dircæa Riversii.....	68
ornatum.....	433	Distichlis <i>maritima</i>	415
orthosticum.....	433	spicata.....	415
pachydermum.....	433	Ditaphrus.....	250
pseudotaxichondrum.....	433	scymnoides.....	252, 264
pyramidatum.....	433	Docidium baculum.....	432
quadratum.....	433	minutum.....	432
Ralfsii	433	Dodecatheon Jeffreyi.....	406
rhombusoides	433, 436	Dothidea morbosa.....	447
sublobatum.....	433	Dove, mourning.....	425
tetraophthalmum.....	433	Downingia concolor.....	135
triplicatum.....	433	Draba cuneifolia.....	60
tumidum.....	433	var. brevipes.....	60
Cotyledon laxa ..	397	Sonoræ.....	59
lanceolata.....	397	<i>Drepanolobus</i>	145, 146
Crane, sandhill.....	420	<i>crassifolius</i>	147
Crossbill, Mexican	297	lanatus.....	148
Crossosoma.....	378	scoparius.....	147
Crow, American.....	422	Dryobates pubescens gairdneri.....	426
Cryptobium.....	33, 211	villosus harrisii.....	421
fractiforme.....	211	Eagle, golden.....	421
Cucurbitaria ribis.....	446	Echlaster.....	38, 232
Cureulionidæ.....	166	<i>Echidiocarya Californica</i>	407
Curculios.....	65, 66, 67	Echidnogllossa.....	259, 260
Cuscuta subinclusa.....	408	Echinocystis Guadalupensis.....	398
Cyanocitta stelleri frontalis.....	422	lobata	521
Dacnochilus.....	38, 229	macrocarpa.....	398
Datura meteloides.....	408	muricata	522, 523
Daucus pusillus.....	399	Eclipse, solar annular, March 5, 1886..	91
Decarthron.....	464	Elaphidion imbelles.....	70
Brendeli——?	456, 464	Eleates.....	253
Delphinium.....	389	occidentalis	254, 264
Dendroica æstiva.....	430	Eledona	254
auduboni.....	307, 423, 430	Elymus condensatus	415
Dendromecon flexile.....	389	Emmenanthe penduliflora.....	407
Harfordii.....	379	Empidonax difficilis.....	427
<i>Dentaria integrifolia</i>	389	Encelia Californica.....	402
<i>tenella</i>	389	Epilobium coloratum.....	398
Desmidiium Baileyi.....	432	Equisetum——	415
Desmids of the Pacific Coast.....	432	Eremocarpus setigerus.....	412
Diabrotica 12-punctata.....	67	Ergates spiculatus.....	70
Diatoms.....	437	Erigeron Canadensis	401
Diaporthe rostellata.....	445	glaucus	401
tessera.....	445	stenophyllus	401
Diatrype Rhois.....	444	Eriogonum arborescens.....	379, 410
Diatrypella Frostii.....	444	grande.....	410

<i>Eriogonum rubescens</i>	410	<i>Galium aparine</i>	400
<i>Eriophyllum confertiflorum</i>	403	<i>buxifolium</i>	150, 400
<i>stæchadifolium</i>	404	<i>Catalinense</i>	400
<i>Erodium cicutarium</i>	392	<i>flaccidum</i>	400
<i>moschatum</i>	392	Geodetic data, standard.....	319
<i>Erythraea pinnatum</i>	390	<i>Geothlypis trichas occidentalis</i>	430
<i>Erythraea Douglasii</i>	407	<i>Gilia atraetlyoides</i>	407
<i>Eschscholtzia glauca</i>	389	<i>filifolia</i>	407
<i>ramosa</i>	389	<i>multicaulis</i>	407
<i>Euastrum binale</i>	434	<i>Gnaphalium decurrens</i> , var. <i>Californi-</i>	
<i>elegans</i>	434	<i>cum</i>	402
<i>inermis</i>	434	<i>purpureum</i>	402
<i>simplex</i>	434	<i>ramosissimum</i>	402
<i>spinosum</i>	434	<i>Sprengelii</i>	402
<i>Eucalais</i>	45	<i>Gnatcatcher</i> , blue-gray.....	431
<i>Eucrypta chrysanthemifolia</i>	407	<i>Gnomonia setacea</i>	445
<i>Eulobus californicus</i>	398	<i>Godetia epilobioides</i>	398
<i>Eumicroseris</i>	45	<i>purpurea</i>	398
<i>Eumitocerus</i>	206	<i>Gonostoma Yatesii</i>	355
<i>tarsalis</i>	207, 264	<i>Goldfinch</i> , Arkansas.....	428
<i>Euphorbia</i>	56	<i>Lawrence's</i>	422, 429
<i>inæquilatera</i>	56, 57	<i>Goose</i> , American white-fronted.....	279
<i>Neo-Mexicana</i>	56	<i>Grindelia latifolia</i>	379
<i>Parishii</i>	56	<i>robusta</i>	400
<i>Rusbyi</i>	57	<i>squarrosa</i>	441
<i>sanguinea</i>	56, 57	<i>Grosbeak</i> , black-headed.....	429, 449
<i>serpyllifolia</i>	56, 57	<i>Evening</i>	449
var. <i>consanguinea</i>	56	<i>Discovery of nest and eggs of</i> ..	449
<i>velutina</i>	57	<i>Grus mexicana</i>	420
<i>Euplectus</i>	476	<i>Guadalupe Island</i> , additions to the or-	
<i>californicus</i>	456, 476	<i>nithology of</i>	269
<i>confluens</i>	478	<i>Gull</i> , western.....	274
<i>Eutrichites Zimmermanni</i>	482	<i>Habenaria elegans</i>	413
<i>Falco mexicanus</i>	273	<i>Habia melanocephala</i>	429
<i>sparverius</i>	280, 421, 426	<i>Habrocerus</i>	206
<i>Fauna</i> , mammalian, of Madagascar, re-		<i>Hadobregmus gibbicollis</i>	68
marks on.....	519	<i>Harporhynchus redivivus</i>	423, 430
<i>Filago Californica</i>	402	<i>Hawk</i> , American sparrow.....	421
<i>Flicker</i> , <i>Guadalupe</i>	285, 290	<i>Cooper's</i>	421
<i>red-shafted</i>	421, 426, 452	<i>sharp-shinned</i>	420, 426
<i>species of</i>	288, 289, 290, 291	<i>Hazardia detonsa</i>	401
<i>Flora of the Coast Islands of California</i>		<i>serrata</i>	401
in relation to recent changes in Phys-		<i>Hedobia granosa</i>	68
ical Geography.....	515	<i>Helianthemum occidentale</i>	144, 391
<i>Flycatcher</i> , ash-throated.....	427	<i>scoparium</i>	391
<i>Baird's</i>	427	<i>Helianthus annuus</i>	402
<i>Fossil and Sub-Fossil Land Shells in</i>		<i>Helicodiscus lineatus</i>	367
the United States, corrections of ar-		<i>Heliotropium curassavicum</i>	407
ticle on, in Vol. I.....	376	<i>Helix ayersiana</i>	361
<i>Frankenia grandifolia</i>	391	<i>dallii</i>	355
<i>Franseria bipinnatifida</i>	402	<i>diaboloensis</i>	363, 365
<i>Fungi of the Pacific Coast</i> . V.....	438	<i>dupetithouarsi</i>	362, 363
<i>Galium angustifolium</i>	400	<i>facta</i>	361
		<i>fidelis</i>	355, 360, 362

<i>Helix mormonum</i>	359, 364	<i>Hyalina minuscula</i>	367
<i>remondi</i>	361	<i>Hyalotheca mucosa</i>	432
<i>rufocincta</i>	361	<i>Hydrophilidae</i>	166
<i>traski</i>	361, 362, 363, 364	<i>Hylesinus crenatus</i>	66
<i>franki</i>	359	<i>Hylotropes ligneus</i>	70
<i>tudiculata</i>	359	<i>Hypochæris glabra</i>	405
<i>Hemistenus reconditus</i>	261	<i>Icterus bullockii</i>	428
<i>tarsalis</i>	261	<i>cucullatus nelsoni</i>	428
<i>Hemizonia fasciculata</i>	403	<i>Ilyobates</i>	260
<i>Hesperobium</i>	33, 38, 211, 228	<i>Jay, blue-fronted</i>	422
<i>californicum</i>	35, 36	<i>California</i>	422, 427
<i>Hesperocichla nævia</i>	318	<i>Julus</i>	72
<i>Hesperocordum</i>	128, 129, 139	<i>Junco, Guadalupe</i>	300
<i>Lewisii</i>	142	<i>insularis</i>	300
<i>Heteromeles arbutifolia</i>	397	<i>hyemalis oregonus</i>	299, 423
<i>Heterothops</i>	208	<i>Oregon</i>	299, 423
<i>exilis</i>	208	<i>Juncus Balticus</i>	414
<i>occidentis</i>	263	<i>bufonius</i>	414
<i>Heuchera maxima</i>	149, 397	<i>effusus</i>	414
<i>Hieracium argutum</i>	406	<i>Jupiter, transits of satellites</i>	89
<i>Holopleura Helena</i>	71	<i>Kellermannia polygoni</i>	439
<i>Homæotarsus</i>	36	<i>sisyrinchii</i>	439
<i>Homallium algarum</i>	236	<i>yuccægena</i>	439
<i>Hookera</i>	127, 130, 136	<i>Killdeer</i>	425
<i>Californica</i>	136	<i>Kingbird, Arkansas</i>	427, 452
<i>coronaria</i>	127, 136	<i>Cassin's</i>	427
<i>filifolia</i>	138	<i>Kinglet, dusky</i>	314
<i>minor</i>	136	<i>ruby-crowned</i>	424, 431
<i>Orcuttii</i>	138	<i>Krynitzkia Jonesii</i>	407
<i>rosea</i>	137	<i>leiocarpa</i>	407
<i>stellaris</i>	137	<i>micromeres</i>	407
<i>terrestris</i>	137	<i>Lanius ludovicianus excubitorides</i>	306, 430
<i>Hordeum murinum</i>	415	<i>Lark, ruddy-horned</i>	421, 427
<i>Horkelia Californica</i>	416	<i>Larus occidentalis</i>	274
<i>var. sericea</i>	416	<i>Lathrimæum</i>	243
<i>Kelloggii</i>	416	<i>humerales</i>	243, 264
<i>Parryi</i>	416	<i>Lathrobium</i>	38, 229
<i>Hosackia maritima</i>	395	<i>Lathyrus vestitus</i>	395
<i>occulta</i>	394	<i>Latitude of the Lick Observatory</i>	121
<i>parviflora</i>	395	<i>Lavatera</i>	516, 518, 519
<i>purshiana</i>	395	<i>Layia platyglossa</i>	403
<i>strigosa</i>	395	<i>Lena</i>	211, 229
<i>subpinnata</i>	395	<i>testacea</i>	212
<i>House Finch, crimson</i>	422, 428, 453	<i>Lepidium Menziesii</i>	390
<i>Guadalupe</i>	293	<i>nitidum</i>	390
<i>Hummingbird, Anna's</i>	292, 421, 427	<i>Lepidospartum squamatum</i>	404
<i>black-chinned</i>	427	<i>Lepigonum macrothecum</i>	392
<i>caliope</i>	452	<i>Leptacinus</i>	261, 264
<i>rufous</i>	427	<i>Leptogenius</i>	214, 229
<i>Hyalina arborea</i>	359	<i>brevicornis</i>	215, 225, 264
<i>Breweri</i>	367	<i>Leptorus</i>	217, 220, 229
<i>cellaria</i>	367	<i>bicolor</i>	222
<i>limatula</i>	367		
<i>milium</i>	367		

<i>Leptorus longiceps</i>	224	<i>Lupinus hirsutissimus</i>	394
<i>picipes</i>	264	<i>microcarpus</i>	394
<i>texanus</i>	221	<i>nanus</i>	394
<i>versicolor</i>	224	<i>truncatus</i>	394
<i>Leptosphaeria arvensis</i>	445	<i>umbellatus</i>	145
<i>Leptosyne gigantea</i>	379, 402	<i>Lyctus striatus</i>	69
<i>Leptura crassipes</i>	71	<i>Lyngbya</i> ?.....	437
<i>laeta</i>	71	<i>Lyonothamnus</i>	378
Lick Observatory, latitude.....	121	<i>asplenifolius</i>	149, 379, 397
<i>Lilium Humboldtii</i>	413	<i>Lythrum Californicum</i>	397
<i>Limax agrestis</i>	367	“ <i>Macrocyclus</i> ”.....	376
<i>amalia hewstoni</i>	367	<i>vancouverensis</i>	358
<i>campestris</i>	367	<i>Macroscapa</i>	127, 130
<i>Limnichus</i>	253	<i>Madia filipes</i> ..	403
<i>Limnocharis</i>	166, 167	<i>Mairania alpina</i>	489
<i>angustula</i>	166, 167, 168, 169	<i>Malacothrix incana</i>	153, 386, 405
<i>alutacea</i>	166, 167, 169, 170	<i>indecora</i>	152, 405
<i>congener</i>	166, 167, 170	<i>squalida</i>	152, 406
<i>coniciventrtris</i> ..	166, 167, 171	<i>tenuifolia</i>	405
<i>picea</i>	166, 167, 168	<i>Malva parviflora</i>	392
<i>polita</i>	166, 167, 168, 169	<i>Malvastrum Thurberi</i> , var. <i>laxiflorum</i> ..	392
<i>Linaria Canadensis</i>	408	<i>Manzanitas, Californian</i>	483
<i>Liparocephalus</i>	38, 229, 232	<i>Marah minima</i>	523
<i>Lithocharis</i>	1, 4, 14, 229, 232	<i>muricatus</i>	521
<i>alutacea</i>	232	priority of, over <i>Megarrhiza</i>	521
<i>confluens</i>	32	<i>Matricaria occidentalis</i>	150
<i>consanguinea</i>	21, 23	<i>Mazzantia gali</i>	446
<i>contigua</i>	22	<i>Meadowlark, western</i>	293, 422, 428
<i>convergens</i>	15, 18	<i>Meconella denticulata</i>	59
<i>corticina</i>	32	<i>Oregana</i>	59
<i>gregalis</i>	26, 28	<i>Meconopsis heterophylla</i>	389
<i>languida</i>	28	<i>Medicago denticulata</i>	394
<i>latiuscula</i>	19	<i>Medon</i>	229, 231
<i>lepida</i>	16, 17	<i>Megarrhiza Californica</i>	522
<i>luctuosa</i>	24	<i>Oregana</i>	522
<i>malaca</i>	18	<i>Melandryidæ</i>	68
<i>nimula</i>	27	<i>Melanerpes formicivorus bairdi</i>	421
<i>ochracea</i>	232	<i>Melica imperfecta</i>	415
<i>puberula</i>	17	<i>Melilotus parviflora</i>	394
<i>quadricollis</i>	232	<i>Melospiza fasciata heermanni</i>	423
<i>retrusa</i>	24, 25	<i>lincolni</i>	302, 423
<i>sinuatoecollis</i>	14, 18	<i>Mentzelia micrantha</i>	398
<i>sublesta</i>	21	<i>Merismopedia glauca</i>	437
revision of.....	1	<i>Merula migratoria propinqua</i>	317, 424, 431, 453
<i>Lomechusa</i>	202	<i>Mesembrianthemum æquilaterale</i>	399
<i>montana</i>	202	<i>crystallinum</i>	399
<i>Lonicera hispidula</i>	400	<i>Mesitis tardii</i>	66
<i>subspicata</i>	400	<i>Mesodon armerigerus</i>	358, 365, 367
<i>Lophiostoma acervatum</i>	445	<i>ptychophora</i>	376
<i>Loxia curvirostra stricklandi</i>	297, 298	var. <i>major</i>	376
<i>Lucanidæ</i>	70	var. <i>minor</i>	376
<i>Lupinus affinis</i>	394	<i>Mesomphix duranti cæolata</i>	367
<i>carosulus</i>	144	<i>planorboides</i>	376
<i>Chamissonis</i>	393		

Mesomphix, vancouverensis.....	367	Nighthawk, western.....	426
sportella.....	359, 367	Nisa.....	182
simplicilabris.....	367	Nisaxis.....	182, 183, 466
Metaxyodonta.....	4, 29, 38, 232	cincinnata.....	456, 466, 482
alutacea.....	30	maritima.....	456, 468
quadricollis.....	31, 32	Nostoc.....	437
Mexican names of birds.....	273, 274	Nothocalais.....	54
Micrasia hirtella.....	65, 67	cuspidata.....	55
Micrasterias furcata.....	434	Suksdorfii.....	54
pinnatifida.....	434	troximoides.....	55
radiosa.....	434	Notholena candida.....	415
Microphysa conspecta.....	367	Nuthatch, red-breasted.....	313
pygmæa.....	367	slender-billed.....	424
Micropus Californicus.....	402	Ocean Currents contiguous to the	
melanoleucus.....	291	Coasts of California.....	337
Microseris.....	44, 45, 48, 49, 51, 52, 53, 54	Oceanodroma leucorhoa.....	276, 278, 450
acuminata.....	46	macroductyla.....	450
aphanocarpa.....	47	Ædagonium undulatum.....	437
attenuata.....	46	cryptoporum.....	437
Bigelovii.....	46, 47	Enothera bistorta.....	398
Douglasii.....	45	cheiranthifolia.....	398
elegans.....	47	Hookeri.....	398
Forsteri.....	53	Odontæus obesus.....	69
laciniata, var. procera.....	51	Oligomeris subulata.....	391
major.....	54	Oligopterus.....	4, 12, 38, 229, 231
var. laciniata.....	54	cuneicollis.....	13
nutans.....	54	Oncideres cingulatus.....	65
Parishii.....	46	Ophiocytium cuspidatum.....	437
platycarpa.....	45	cochleare.....	437
procera.....	51	majus.....	437
pygmæa.....	47	Opuntia Engelmanni, var. littoralis....	398
sylvatica, var. Stillmani.....	52	Oreortyx pictus plumiferus.....	420
troximoides.....	55	Oriole, Arizona hooded.....	428
Milla.....	129, 135, 139	Bullock's.....	428
Mimulus cardinalis.....	409	Ornithogalum ixioides.....	142
floribundus.....	409	Ornithological observations in San Di-	
nasutus.....	409	ego County.....	419
Mimus polyglottus.....	308, 430	Ornithology of Guadalupe Island, ad-	
Mirabilis Californica.....	411	ditions to.....	269
Mocking Bird.....	308, 430	Orobanus.....	245
Monarthrum dentigerum.....	66	densus.....	246, 247, 264
Huttoni.....	66	rufipes.....	245, 247, 264
scutellare.....	66	simulator.....	247
Montagnella tumefaciens.....	447	Oropus.....	196, 479
Muhlenbergia debilis.....	414	abbreviatus.....	200
Myadestes townsendii.....	424	convexus.....	198
Myiarchus cinerascens.....	427	interruptus.....	199, 482
Nasturtium aquaticum.....	390	montanus.....	456, 479
officinale.....	390	striatus.....	197
Necydallis lævicollis.....	71	Oroscoptes montanus.....	307
Nemophila racemosa.....	407	Orthocarpus densiflorus.....	409
Nesting sites, unusual.....	451	Orus.....	36, 38, 217, 226, 229
Nicotiana Clevelandi.....	408	parallelus.....	227

<i>Orus punctatus</i>	264	<i>Phyllachora pteridis</i>	446
<i>Otocoris alpestris rubea</i>	421, 427	<i>Phyllopappus lanceolatus</i>	53
Owl, American barn.....	426	<i>Phyllospadix Torreyi</i>	414
burrowing.....	284, 426	<i>Phyllosticta angelicæ</i>	438
Western horned.....	421, 426	<i>cruenta</i>	438
<i>Pæderus</i>	229	<i>Pinophili</i>	262
<i>Parietaria debilis</i>	412	<i>Pinus insignis</i>	413
Partridge, California.....	425	Pipit, American.....	307
plumed.....	420	<i>Pipilo consobrinus</i>	273, 303
valley.....	420	<i>fuscus crissalis</i>	423, 429
<i>Parus gambeli</i>	424	<i>maculatus megalonyx</i>	423
<i>inornatus</i>	424	<i>Pisidium occidentale</i>	357
<i>Passer domesticus</i>	454	<i>Plagiobothrys Californicus</i>	407
<i>Passerella iliaca unalaschensis</i>	303, 423	<i>Cooperi</i>	407
<i>Passerina amoena</i>	429	<i>Plantago major</i>	410
<i>Patula perspectiva</i>	355	<i>patagonica</i>	410
<i>striatella cronkhitei</i>	358, 359	<i>Platycerus</i>	263
<i>Pectocarya penicillata</i>	407	<i>Agassii</i>	70, 263
<i>Pediastrum Boryanum</i>	436	<i>Californicus</i>	263
<i>forcipatum</i>	436	<i>depressus</i>	263
<i>Ehrenbergii</i>	436	<i>Oregonensis</i>	70, 263
<i>Pelecomalium</i>	241	<i>Platyrhinus latirostris</i>	66
<i>binotatum</i>	241, 242, 264	<i>Platystemon Californicus</i>	389
<i>modestum</i>	241, 242	<i>Platystethus spiculus</i>	262
<i>Pellæa andromedæfolia</i>	415	<i>Platystigma denticulatum</i>	389
<i>ornithopus</i>	415	<i>Pleospora frangulæ</i>	445
<i>Penium digitus</i>	432	<i>leguminum</i>	445
<i>minutum</i>	432	<i>oligomera</i>	446
<i>curtus</i>	432	<i>salsolæ</i>	445
<i>Pentacæna ramosissima</i>	392	<i>typhæ</i>	446
<i>Pentstemon cordifolius</i>	409	<i>Pogonocherus crinitus</i>	71
<i>Perezia microcephala</i>	405	<i>Poliophtila carulea</i>	431
<i>Perityle Fitchii</i>	403	<i>Polyborus lutosus</i>	281
<i>Peronospora oxybaphi</i>	444	<i>Polycaon confertus</i>	69
<i>viticola</i>	442	<i>Stoutii</i>	68
<i>Pestalozzia gibbosa</i>	439	<i>Polydesmus</i>	72
<i>Petre</i> Guadalupe.....	450	<i>Polygonum aviculare</i>	411
Leach's.....	276	<i>Polygyra harfordiana</i>	356, 359
new subspecies from Guadalupe		<i>Polygyrella</i>	356
Island.....	450	<i>Polypetale</i> , new.....	58
<i>Petrochelidon lunifrons</i>	429	<i>Polyphylla decemlineatus</i>	69
<i>Pencedanum</i> ———?.....	399	<i>Polypodium Californicum</i>	415
<i>Phacelia hispida</i>	407	<i>Polypogon Monspeliensis</i>	414
<i>Parryi</i>	407	<i>Pocætes gramineus confinis</i>	429
<i>suffrutescens</i>	407	<i>Poor-will</i>	426
<i>Phalænoptilus nuttallii</i>	426	<i>Populus trichocarpa</i>	412
<i>Phalaris Canariensis</i>	414	Poway Valley, birds of.....	425
<i>Phleopterus</i>	234	<i>Prionus Californicus</i>	64, 70
<i>filicornis</i>	234	<i>laticollis</i>	64, 65
<i>Phœbe</i> , black.....	427	<i>Prophysaon andersoni</i>	367
Say's.....	453	<i>hemphilli</i>	367
<i>Phyllachora effusa</i>	446	<i>Prunus ilicifolia</i>	385
<i>polemonii</i>	446	<i>occidentalis</i>	385, 395, 396, 486
		<i>Psaltriparus minimus californicus</i>	424, 431

<i>Pselaphidæ</i>	166	<i>Pupa ovata</i>	361
some new North American.....	455	<i>Pupilla corpulenta</i>	358, 360
<i>Pseudogryphus californianus</i>	425	<i>rowelli</i>	367
<i>Pteris aquilina</i>	415	<i>californica</i>	367
<i>Pterostegia drymarioides</i>	411	<i>Pytna</i>	457
<i>Ptilinus basalis</i>	65, 68	<i>corticina</i>	456, 458
<i>Ptilium</i>	248	<i>Quercus agrifolia</i>	413
<i>Hornianum</i>	249	<i>chrysolepis</i>	412
<i>sulcatum</i>	248, 264	<i>dumosa</i>	412
<i>Ptilocalais</i>	53	<i>parvula</i>	413
<i>gracililoba</i>	54	<i>tomentella</i>	412
<i>major</i>	54	<i>Raffrayia</i>	478
<i>nutans</i>	54	<i>Rafinesquia Californica</i>	405
<i>Ptilophora</i>	42, 43, 53, 54	<i>Ramona</i>	213, 229
<i>Ptinidæ</i>	68	<i>capitulum</i>	213
<i>Ptinus interruptus</i>	68	<i>Ramularia evonymi</i>	438
<i>quadrimaculatus</i>	68	<i>heraclei</i>	438
<i>Puccinia artemisiarum</i>	441	<i>menthicola</i>	438
<i>balsamorrhizæ</i>	441	<i>mimuli</i>	438
<i>Clarkiæ</i>	441	<i>Ranunculus alismæfolius</i>	58
<i>convolvuli</i>	441	<i>Bolanderi</i>	58
<i>Grindeliæ</i>	441	<i>Californicus</i>	388
<i>nigrescens</i>	441	<i>Deppei</i>	388
<i>pimpinellæ</i>	441	<i>Lemmoni</i>	58
<i>plumbaria</i>	441	<i>lingua</i>	58
<i>subcircinata</i>	442	<i>Ludovicianus</i>	58
<i>symphoricarpi</i>	440	<i>Red-tail, western</i>	279, 421, 426
<i>troximontis</i>	441	<i>Regulus calendula</i>	424, 431
<i>violæ</i>	442	<i>obscurus</i>	273, 314
<i>Wyethiæ</i>	442	<i>Reichenbachia</i>	182, 183, 186
<i>Puffinus gavia</i>	275	<i>albionica</i>	189
<i>Pulmonata, Alameda County</i>	368	<i>deformata</i>	195, 264
<i>Bay Region</i>	364	<i>franciscana</i>	186, 193, 264
<i>Biological Deductions</i>	507	<i>fundata</i>	186, 192, 264
<i>Coast Range South of Monterey</i>	361	<i>gracilicornis</i>	186, 190
<i>Contra Costa County</i>	368	<i>informis</i>	186, 189, 264
<i>Extinct Species</i>	355	<i>nevadensis</i>	186, 191
<i>Geographical Distribution</i>	356	<i>tumida</i>	180
<i>Geological Deductions</i>	507	<i>tumidicornis</i>	186, 187, 264
<i>land, found around San Francisco</i>		<i>tumorosa</i>	186, 264
<i>Bay</i>	367	<i>Renocis</i>	257
<i>Marin County</i>	503	<i>heterodoxus</i>	258, 264
<i>Napa County</i>	505	<i>Rhamnus crocea</i>	393
<i>Monterey County</i>	498	<i>ilicifolia</i>	393
<i>San Benito County</i>	498	<i>insularis</i>	392
<i>San Francisco County</i>	501	<i>Rhaphidium polymorphum</i>	437
<i>San Mateo County</i>	499	<i>Rhexidius</i>	478
<i>Santa Clara County</i>	497	<i>granulosus</i>	456, 478, 482
<i>Santa Cruz County</i>	499	<i>Rhus diversiloba</i>	393
<i>Sierra Nevada</i>	357	<i>integrifolia</i>	393
<i>Solano County</i>	507	<i>ovata</i>	393
<i>Sonoma County</i>	504	<i>Ribes subvestitum</i>	397
<i>West Coast—fossil and living</i>	355, 497	<i>Ricinus communis</i>	412
<i>Pupa arizonensis</i>	361		

Robin, western.....	317, 424, 431, 453	Scorzonella procera.....	50
Rock Wren, Guadalupe.....	308	scapigera.....	53
Rœstelia lacerata.....	440	sylvatica.....	52
Rosa Californica.....	397	<i>Scorzonera Lawrencii</i>	53
Rosalia funebris.....	71	scapigera.....	53
Rough-leg, ferrugineus.....	421	Selenites.....	376
Rubus ursinus.....	396	Senecio Douglasii.....	404
Rumex conglomeratus.....	410	Septoria destruens.....	438
crispus.....	410	epilobii.....	438
maritimus.....	410	œnothæ.....	438
salicifolius.....	410	pentstemonis.....	438
<i>Rupalleya</i>	127, 130	rubi.....	438
Rybaxis.....	182	scutellaris.....	439
sanguinea.....	182	stachydis.....	439
conjuncta.....	182	symphoricarpi.....	439
Brendelii.....	182	<i>Scubertia</i>	128, 139
Ryncolus.....	66	Shearwater, black-vented.....	275
Sagina occidentalis.....	392	Shrike, white-rumped.....	306, 430
Salix lævigata.....	412	Sialia arctica.....	318, 431, 454
lasiolepis.....	412	mexicana.....	424, 431, 454
longifolia.....	412	Silene antirrhina.....	391
Salpinctes guadalupensis.....	308	gallica.....	391
obsoletus.....	430	laciniata.....	392
Salvia Columbariæ.....	409	quinquevulnera.....	391
Sambucus glauca.....	399	Silpha.....	171
Samolus Valerandi, var. Americanus..	406	ænescens.....	171
Sanicula laciniata.....	399	cervaria.....	173
Santa Cruz Island, Botany of.....	377	ramosa.....	171, 173
Saturn, Notes on.....	73	Silphidæ.....	166
Saxifraga malvæfolia.....	379, 397	Silybum Marianum.....	404
Sayornis nigricans.....	427	Sinodendron rugosum.....	70
saya.....	453	Sinoxylon declive.....	68
Scarabæidæ.....	69	<i>Sisymbrium canescens</i>	390
Sciocharis.....	232	officinale.....	390
Scolecophagus cyanocephalus.....	422, 453	pinnatum.....	390
Scolytidæ.....	66, 166	Sisyrinchium bellum.....	413, 439
Scolytus destructor.....	66	Sitta canadensis.....	313
Scopæodera.....	217, 220, 229	carolinensis aculeata.....	424
nitida.....	220, 264	Smicrus.....	249
Scopæus.....	38, 216, 217, 229	americanus.....	249, 264
brunnipes.....	220	Solanum Douglasii.....	408
lævigatus.....	217, 264	Xanti, var. Wallacei.....	408
rotundiceps.....	217	Solidago Californica.....	401
truncaticeps.....	219	Solitaire, Townsend's.....	424
Scorzonella.....	49, 50, 54	Sonchus asper.....	406
Bolanderi.....	52	oleraceus.....	406
Howellii.....	52	Sonoma.....	195, 480
laciniata.....	51	cavifrons.....	456, 481
leptosepala.....	51	corticina.....	456, 480, 482
megacephala.....	50	isabellæ.....	481, 482
montana.....	53	parviceps.....	481, 482
paludosa.....	52	Sordaria lanuginosa.....	445
pratensis.....	51	Spanish Voyages of Discovery on the Coast of California.....	325

Sparrow, Bell's.....	429	Stellaria nitens.....	392
Gambel's.....	422, 429	Stenini ..	261, 262
golden-crowned.....	272, 298, 423	Stephanomeria cichoriacea.....	387, 405
Heermann's song.....	423	elata.....	405
Lincoln's	302, 423	intermedia.....	54
Townsend's	272, 303, 423	tomentosa.....	152, 405
western chipping	299, 429	virgata	405
western lark.....	422, 429	Stigmatea geranii.....	445
western savanna.....	422, 429	Stilicopsis.....	229
western vesper.....	429	Stilicus.....	38, 229
Sparrow-Hawk, American.....	280, 426	Stipa ———	414
Specularia perfoliata	406	Strix pratincola	426
Speotyto cunicularia hypogæa.....	254, 426	Stropholirion	127, 130
Sphacele fragrans.....	409	Californicum.....	131
Spharella gaultheriæ	445	Sturnella magna neglecta.....	293, 422, 428
Molleriana.....	445	Suæda Torreyana	411
Sphærozosma excavatum.....	432	Submarine Valleys on the Pacific Coast	
serratum	432	of the United States	265
Spinus lawrencei.....	422, 429	Succinea nuttalliana.....	358, 367
psaltria.....	428	oregonensis.....	358, 367
Spizella socialis arizonæ.....	299, 429	rusticana.....	367
Stachys acuminata.....	410	sillimani.....	367
Staphylinidæ.....	166	stretchiana.....	358, 360
Stars, occultations of, by dark limb of		Sunius	229
the Moon.....	448	Swallow, cliff.....	429
Staurastrum alternans.....	434	violet-green	423, 430
arcticon.....	434	Swift, white-throated..	291
aristiferum.....	434	Symphoricarpus mollis.....	399
Avicula.....	434	Synaphœta Guexi.....	71
Brasiliense, var. triquetrum.....	434, 436	Synchitrium myosotidis.....	440
brevispina.....	434	Syrmatium	145
crenatum.....	434	argophyllum	147
cuspidatum	434	cytisoides.....	147
cyrtocerum.....	435	decumbens.....	148
dejectum.....	435	dendroideum	146, 394
Dickiei.....	435	distichum.....	148
echinatum.....	435	glabrum.....	147
eustephanum.....	435	Heermanni.....	148
furcigerum.....	435	junceum.....	147
fusiforme.....	435	micranthum.....	147
gracile	435	Nevadense.....	148
hirsutum.....	435	niveum.....	148, 394
inconspicuum.....	435	Ornithopus.....	148
leptocladium.....	435	patens.....	147, 394
margaritaceum.....	435	procumbens.....	148
muticum.....	435	prostratum.....	147
paradoxum.....	435	sericeum	147
scabrum.....	435	tomentosum.....	148
Sebaldi.....	435	Veatchii.....	148
subteliferum.....	435	Tachycineta thalassina.....	423, 430
tricornæ.....	435	Tachyusa.....	203
trifidum.....	435	crebrepunctata.....	203
xiphidiophorum.....	435	Tauscheria	384
Stellaria media.....	392	Tenebrionidæ	166

<i>Tetraodon meleagris</i>	155	<i>Trochilus anna</i>	292, 421, 427
<i>setosus</i>	155	<i>callope</i>	452
<i>Thanasimus eximius</i>	71	<i>rufus</i>	427
<i>Thelypodium lasiophyllum</i>	390	<i>Trogaster aberrans</i>	197
<i>Thesium laticolle</i>	482	<i>Troglodytes ædon parkmanii</i> ..	424, 430, 453
<i>Thrasher, Californian</i>	423, 430	<i>Trogosita virescens</i>	71
<i>sage</i>	307	<i>Trogozitidæ</i>	71
<i>Thrush, dwarf hermit</i>	316, 424, 431	<i>Troximon cuspidatum</i>	54, 55
<i>varied</i>	272, 318	<i>heterophyllum</i>	406
<i>Thryothorus brevicaudus</i>	273, 312	<i>marginatum</i>	55
<i>Thyce</i>	39	<i>Turdus aonalaschkæ</i>	316, 424, 431
<i>marginata</i>	39	<i>Tychus</i>	469
<i>squamicollis</i>	40	<i>bipuncticeps</i>	456, 470
<i>Thyridium cingulatum</i>	446	<i>sonomæ</i>	456, 469, 470, 482
<i>Thysanocarpus conchuliferus</i>	390	<i>Tympanis frangulæ</i>	447
<i>ramosus</i>	390	<i>Typha bracteata</i>	413
<i>Tillæa minima</i>	397	<i>Tyrannus verticalis</i>	427, 452
<i>Titmouse, plain</i>	424	<i>vociferans</i>	427
<i>Towhee, Californian</i>	423, 429	<i>Uniola spicata</i>	415
<i>Guadalupe</i>	303	<i>Uredo</i>	440
<i>spurred</i>	423	<i>iridis</i>	440
<i>Trachysectus</i>	38, 229, 230	<i>Urinator pacificus</i>	269
<i>confluens</i>	230	<i>Uromyces euphorbiæ</i>	440
<i>Transits—II and III Satellites of Jupiter</i>	89	<i>psoraleæ</i>	441
<i>Trichobasis helianthellæ</i>	440	<i>zygadeni</i>	441
<i>Trichonyx striatus</i>	197	<i>Urtica holosericea</i>	412
<i>sulcicollis</i>	197	<i>urens</i>	412
<i>Trichopterygidæ</i>	166	<i>Vaccinium ovatum</i>	406
<i>Tricophya</i>	207	<i>Valsa exigua</i>	444
<i>Trifolium amplexans</i>	394	<i>femoralis</i>	444
<i>ciliatum</i>	394	<i>impulsa</i>	444
<i>exile</i>	394	<i>Venegasia carpesioides</i>	403
<i>fucatum</i>	394	<i>Verbena prostrata</i>	409
<i>microcephalum</i>	394	<i>Vicia Americana</i>	395
<i>microdon</i>	394	<i>exigua</i>	395
<i>tridentatum</i>	394	<i>Vireo gilvus</i>	430
<i>Trinium brevicorne</i>	201	<i>warbling</i>	430
<i>Triodopsis loricata</i>	359, 367	<i>Vitrina pfeifferi</i>	358
<i>Triteleia</i>	128, 129, 138	<i>Volcano Mountains, birds of</i>	419
<i>Bridgesii</i>	141	<i>Voyages of Discovery on the Coast of California—Early Spanish</i>	325
<i>candida</i>	139	<i>Vrilletta convexa</i>	68
<i>crocea</i>	141	<i>Vulture, California</i>	425
<i>gracilis</i>	141	<i>turkey</i>	420
<i>grandiflora</i>	139	<i>Warbler, Audubon's</i>	307, 423, 430
<i>Howellii</i>	139	<i>yellow</i>	430
<i>hyacinthina</i>	142	<i>Washoe Rocks</i>	93
<i>ixioides</i>	142	<i>Waxwing, Cedar</i>	303
<i>laxa</i>	140	<i>Weather Types on the Pacific Coast</i>	77
<i>Lemmonæ</i>	141	<i>Wollastonia quercicola</i>	66
<i>lilacina</i>	143	<i>Woodpecker, Californian</i>	421
<i>lugens</i>	142	<i>Gairdner's</i>	426
<i>peduncularis</i>	140	<i>Harris's</i>	421
<i>Trochilus alexandri</i>	427		

Woodwardia radicans.....	415	Xylotrichus nauticus.....	71
Wren, cactus.....	430	planifrons.....	71
Guadalupe.....	312	Yellow Throat, western.....	430
Parkman's.....	424, 430, 453	Zauschneria Californica.....	397
rock.....	430	cana.....	398
Wren-Tit.....	431	villosa.....	397
Xanthidium antilopæum.....	433	Zenaidura macroura.....	425
cristatum.....	434	Zonotrichia coronata.....	298, 423
fasciculatum.....	434	gambeli.....	422, 429
Xanthium Canadense.....	402	Zostera marina.....	414
Xanthocephalus xanthocephalus..	428	Zygadenus Fremonti.....	413
Xerobotrys venulosa.....	490	Zygobaris.....	256
Xylococcus bicolor.....	496		

ERRATA.

Page 41, fourth line from top, for "Chicoriaceous" read "Cichoriaceous."

" 44, third and sixth line from bottom, for "Microsersis" read "Microseris."

" 53, eighteenth line from top, for "Fosteri" read "Forsteri."

" tenth 57, " " "inæquilatera" read "inæquilatera."

" 125, 127, for "Bro licæa" read "Brodixæa."

" 141, twelfth line from bottom, for "Subertia" read "Seubertia."

" 230, in table. For "385 mm." read "384 mm."

" 283, " " 1691 ♂ read 1691 ♀.

" " " " 1699 ♂ " 1699 ♀.

" " " " 2408 ♂ " 2408 ♀.

" " " " 2504 ♂ " 2504 ♀.

" " " " 2581 ♂ " 2581 ♀.

" " " " 2409 ♂ " 2409 ♀.

" 288, second line, for "form" read "forms."

" 289, second table, for "Scott" read "Scott Mt."

" " " " "Mar. 20, 1883," read "Mar. 20, 1880."

" 290, eleventh line, for "Guadeloupe" read "Guadalupe."

" 291, fourteenth line, for "Guadeloupe" read "Guadalupe."

" 299, thirteenth line, for "by omitting" substitute "it having omitted."

" " eighth line, for "Coue's" read "Coues'."

" 303, second table, for "♀ ad." read "ad."

" 308, eleventh line from top, for "polyglottos" read "polyglottus "

" " third " " bottom, for "guadeloupensis" read "guadalu-
pensis."

" 374, fourteenth line from bottom, for 270 read 210.

The reader will observe that throughout "Helix" is used in a general way for "Helicoid species," especially Nos. 26 to 39, in table on p. 367.



LITH. BRITTON & REY

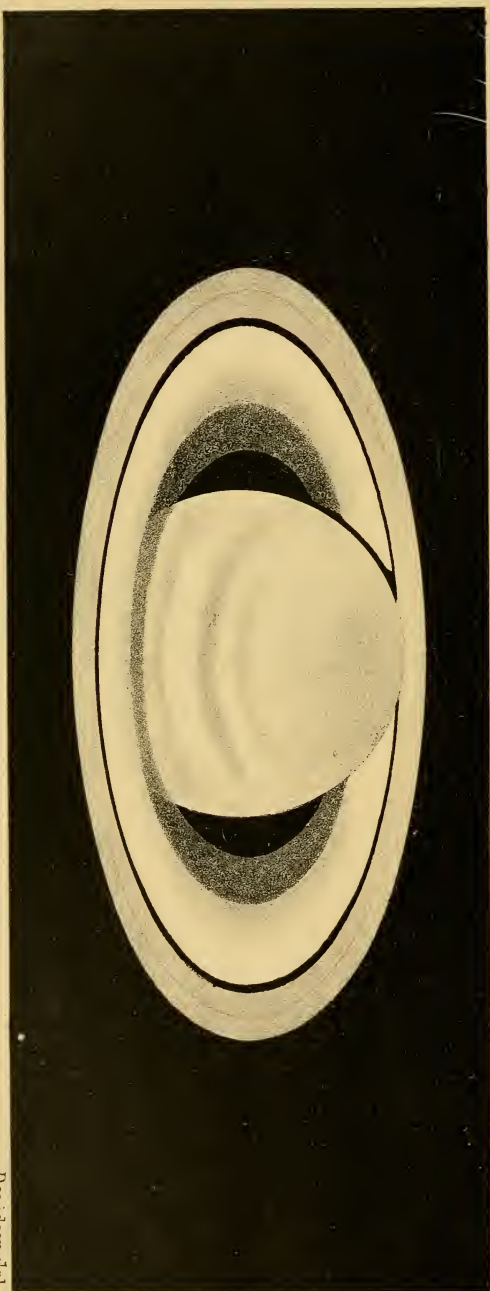
Davidson Observatory.

SATURN

As seen in an Inverting Telescope

November 13th 13^{hr} 21^m

Davidson del.

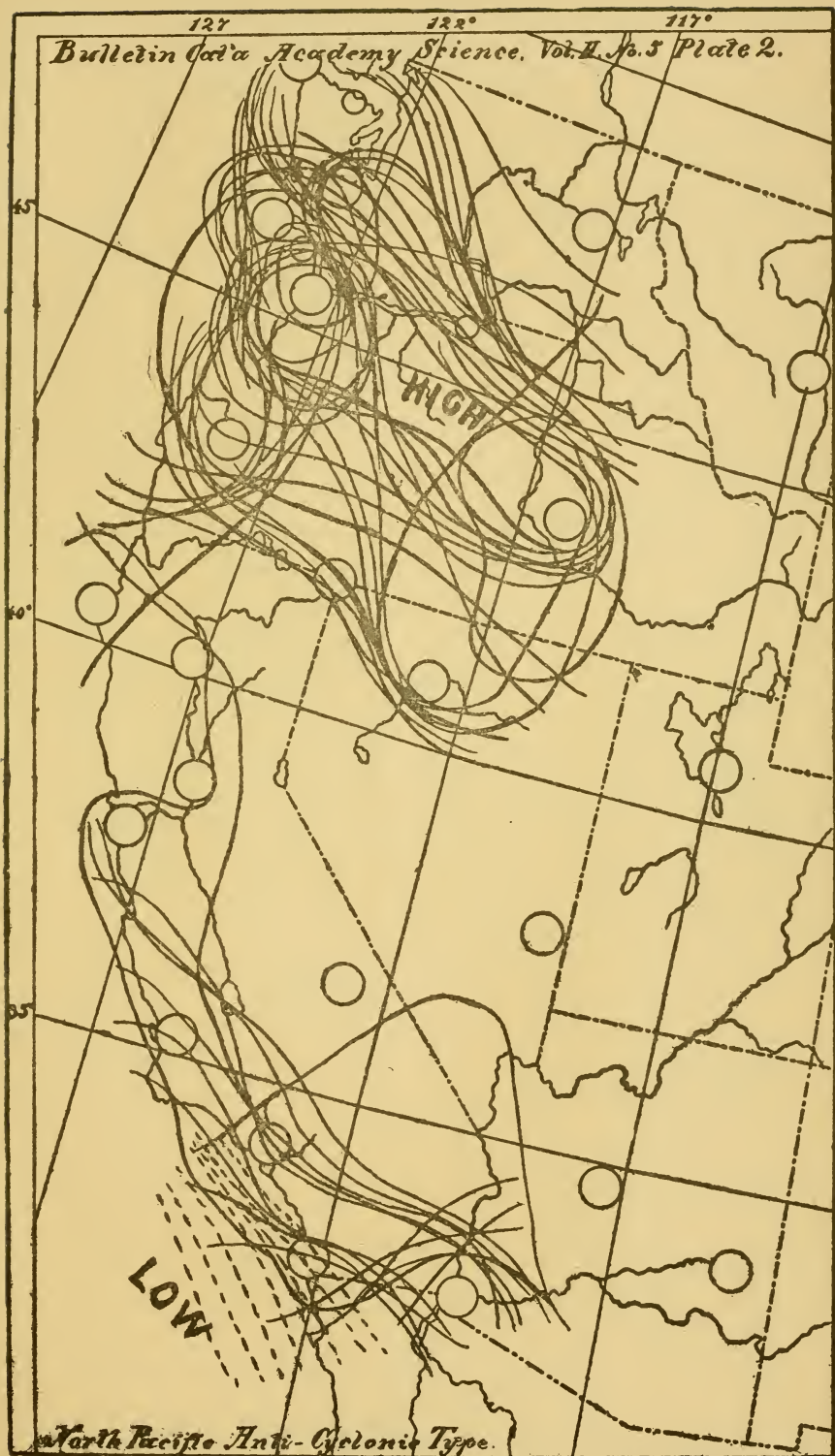


127

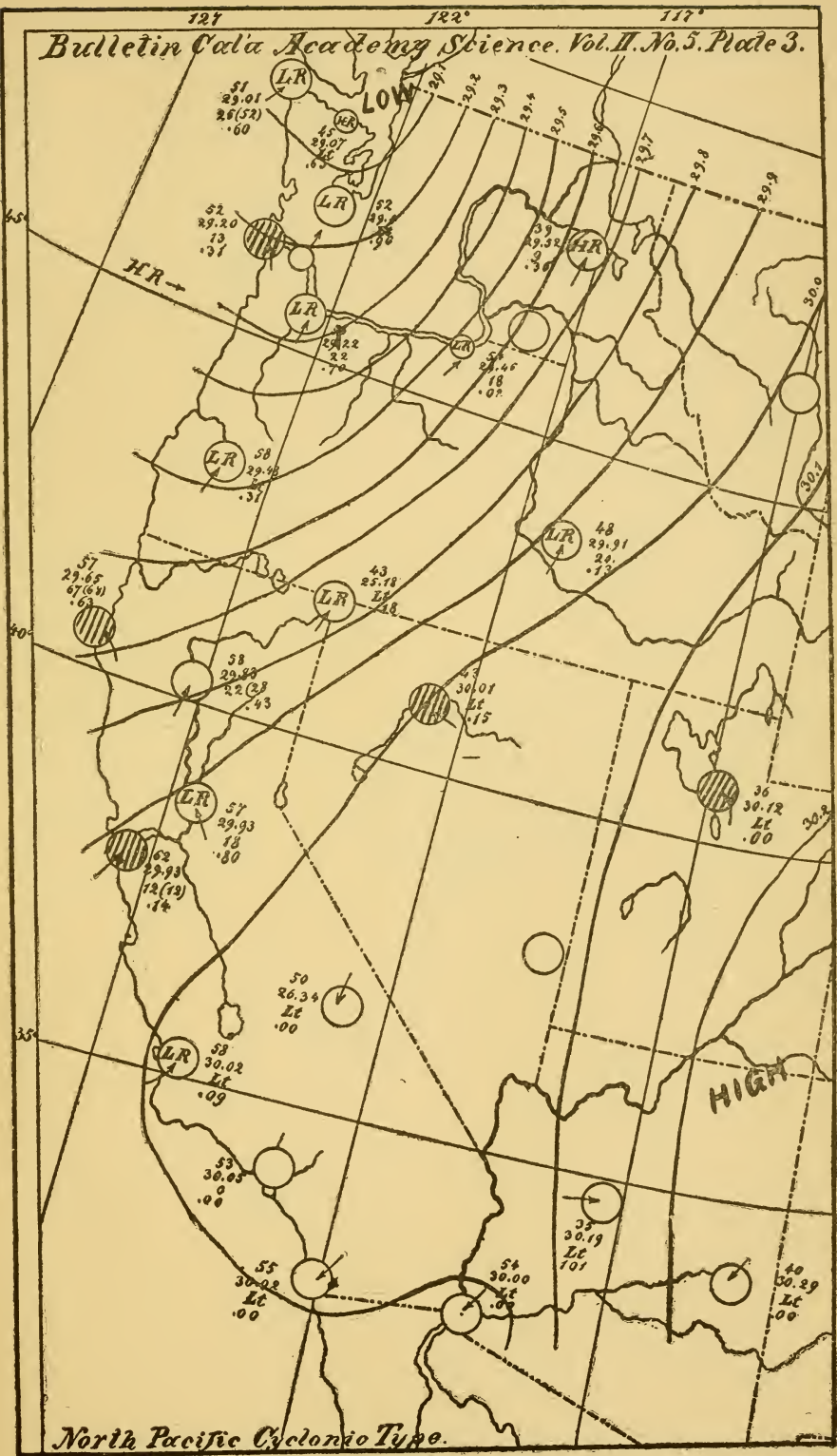
122°

117°

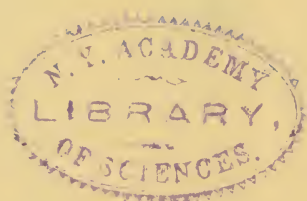
Bulletin of the Academy of Science, Vol. II, No. 5 Plate 2.



Bulletin Calia Academy Science. Vol. II. No. 5. Plate 3.



North Pacific Cyclonic Type.

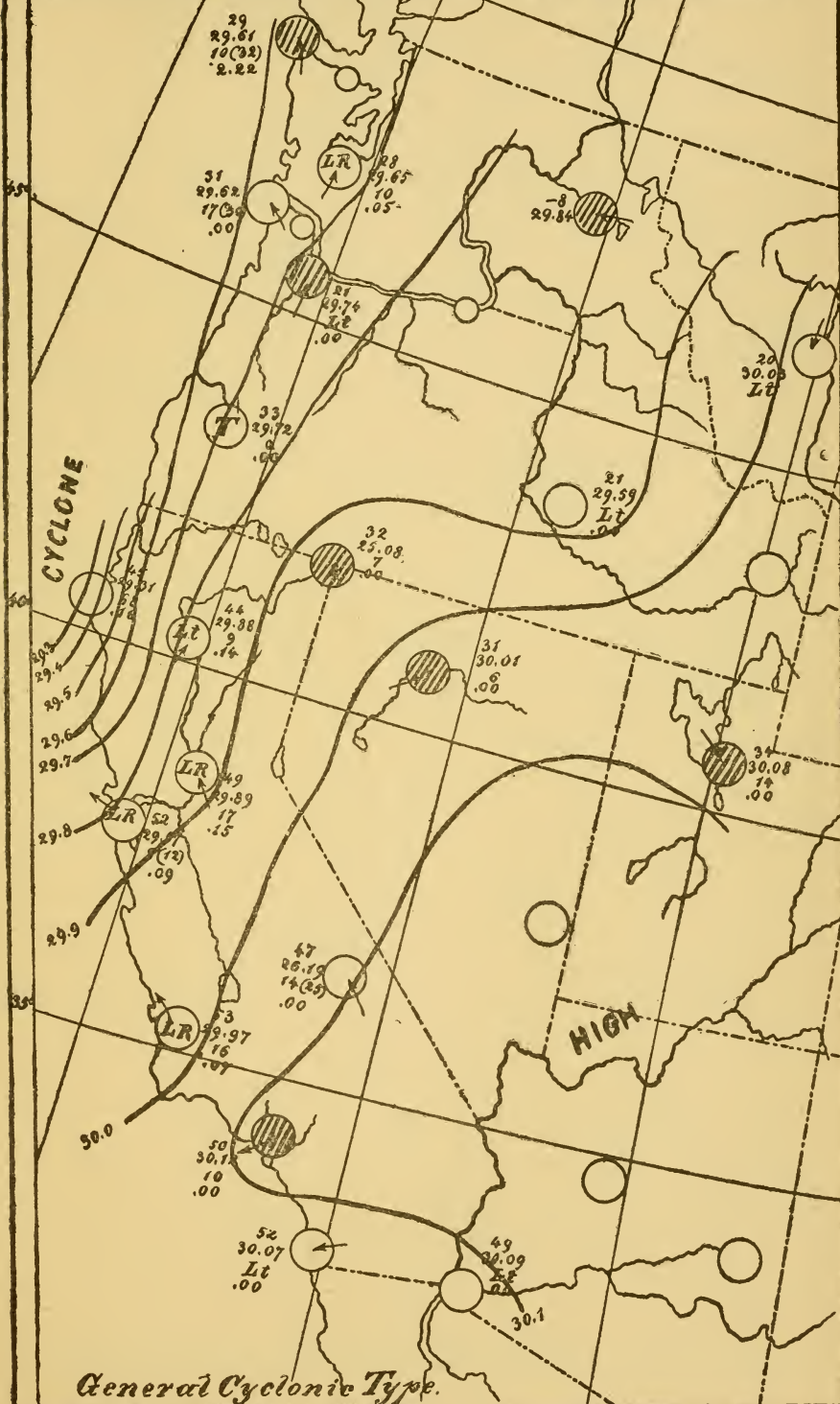


127

122°

117°

Bulletin Cal'ia Academy Science Vol. II No. 5 Plate 4.



General Cyclonic Type.

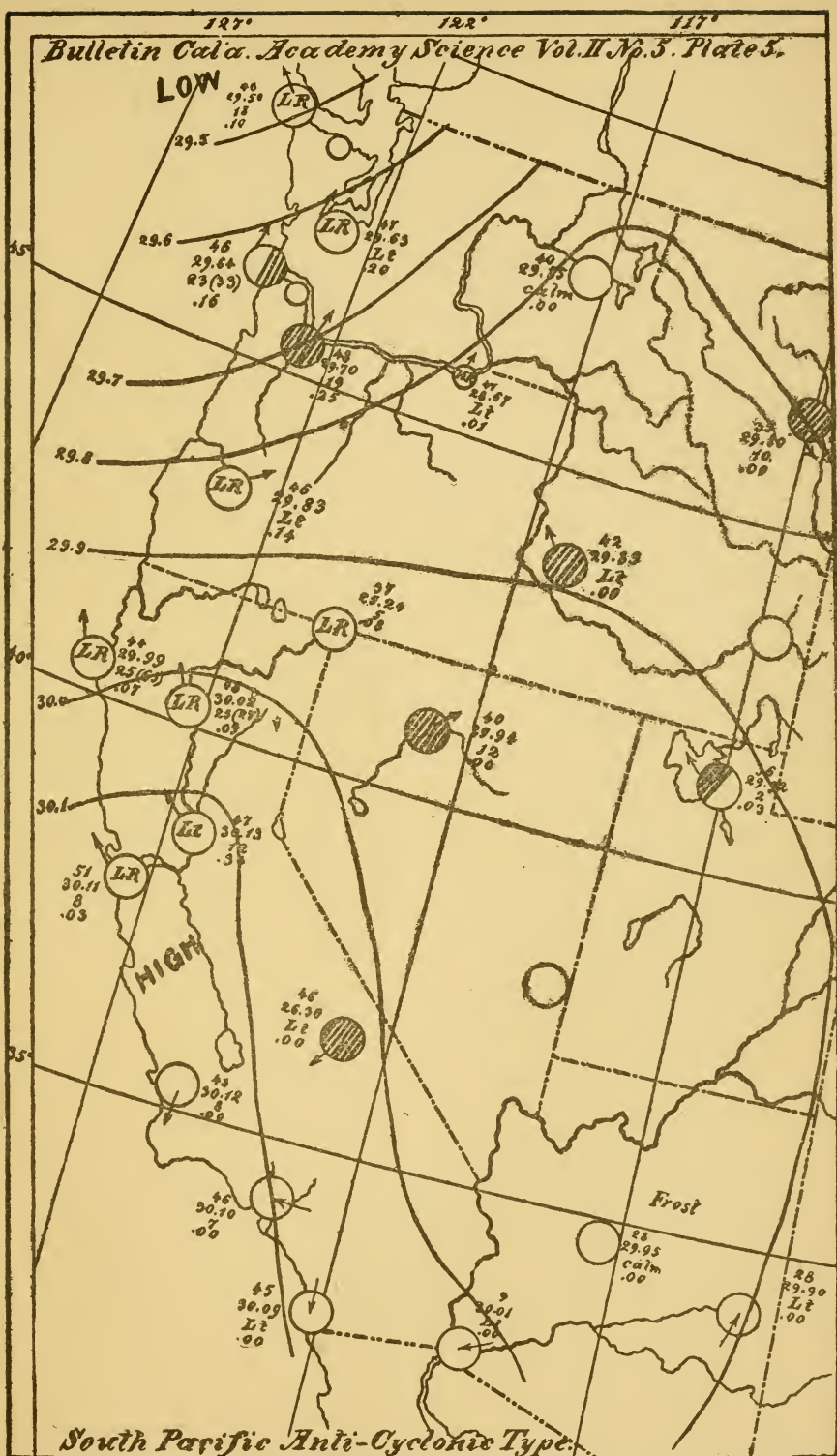
127°

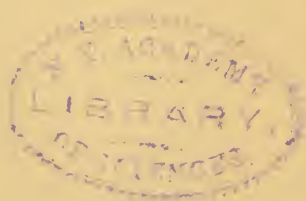
122°

117°

Bulletin Cal. Academy Science Vol. II No. 5. Plate 5.

LOW



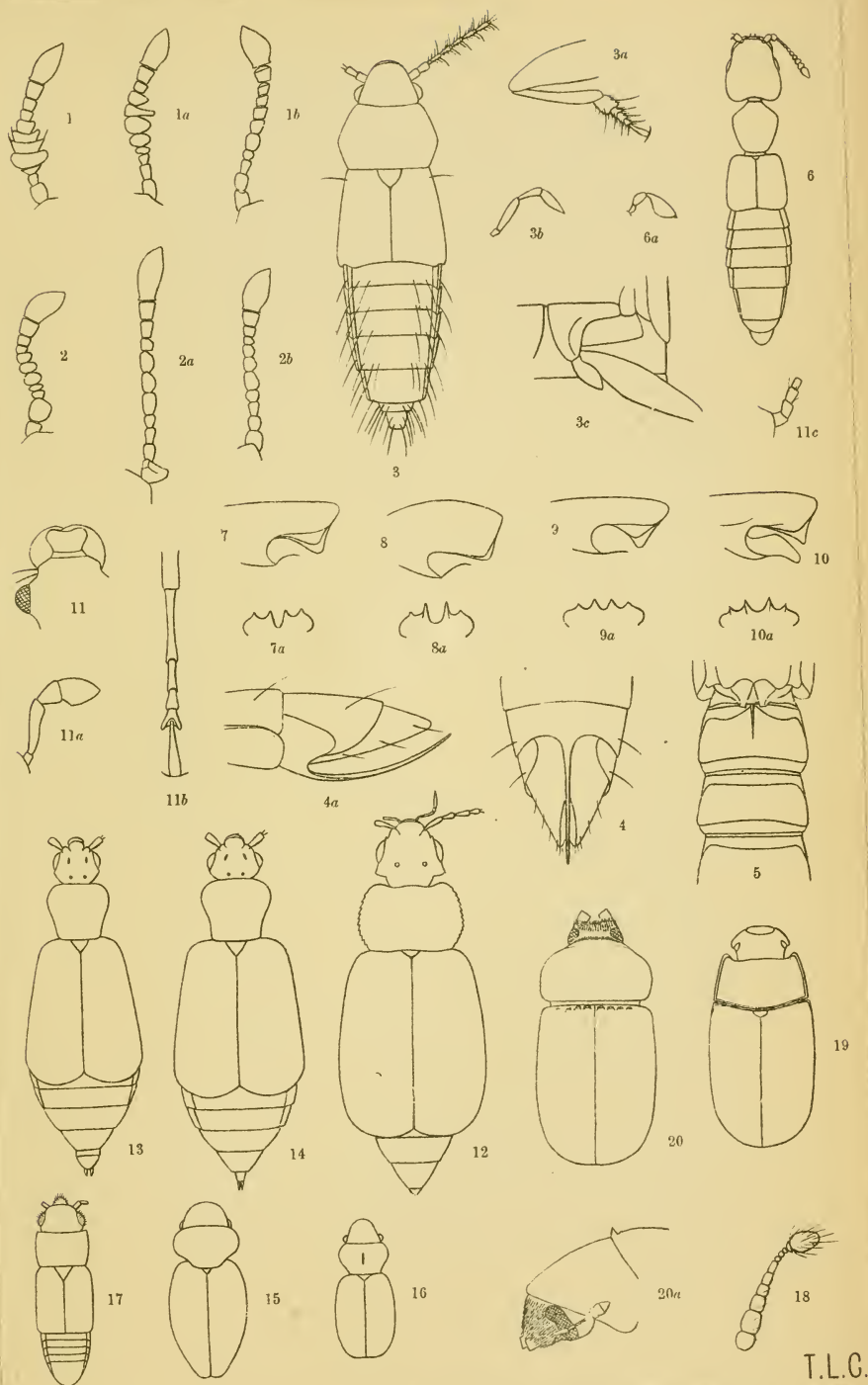




Bosqui Eng Co., S. F.

LYONOTHAMNUS ASPLENIFOLIA GREENE.

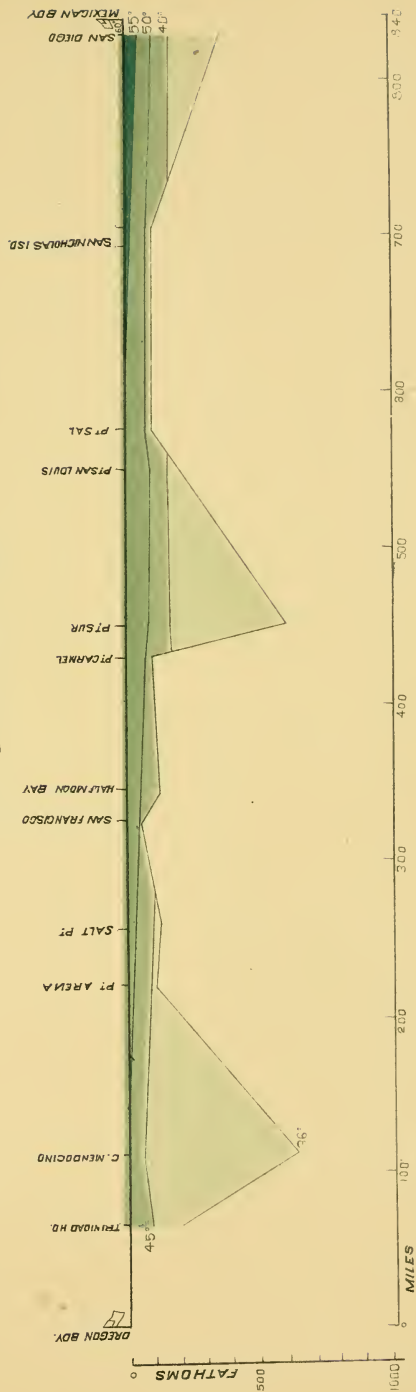
A. KELLOGG DEL.



T.L.C.

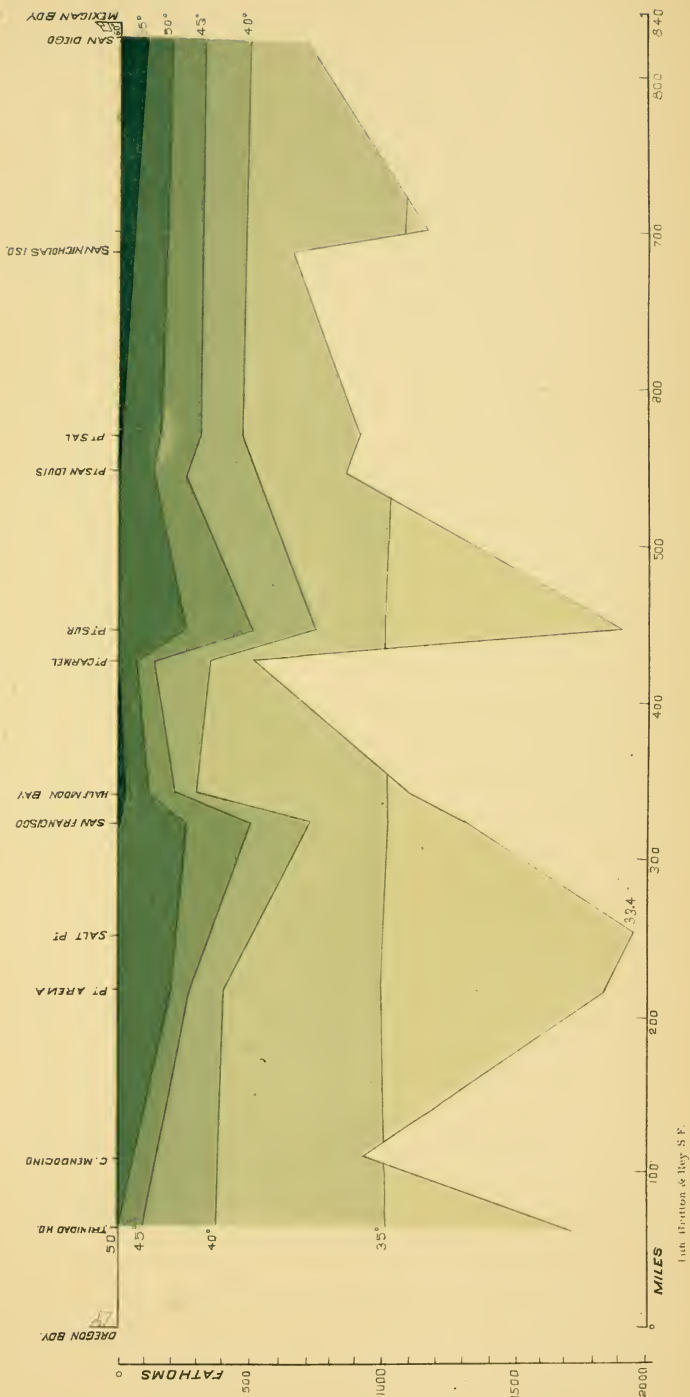
Profile A.

Section of the North Pacific Ocean, between Trinidad Head and San Diego, Cal.
10 miles off shore,
showing Isothermal Lines.



Lith. Burton & Rose, N. Y.

*Section of the North Pacific Ocean, between Trinidad Head and San Diego, Cal.
50 miles off shore,
showing Isothermal Lines.*





Section of the North Pacific Ocean, between Trinidad Head and San Diego, Cal.
100 miles off shore,
showing Isothermal Lines.



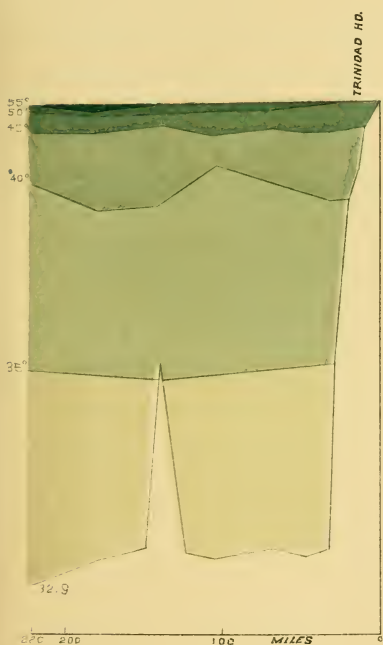
Section of the North Pacific Ocean, between Trinidad Head and San Diego, Cal.
220 miles off shore,
showing Isothermal Lines.





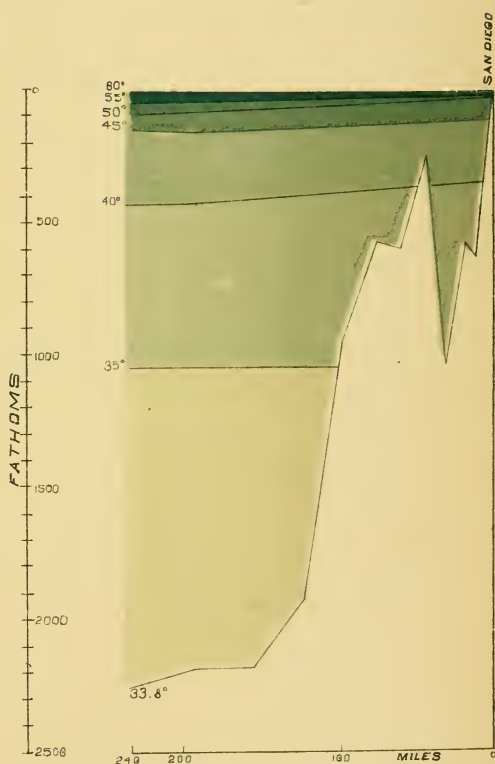
Profile E.

Section of the North Pacific Ocean, between Trinidad Head, Cal., and a position 220 miles West from it, showing Isothermal Lines.

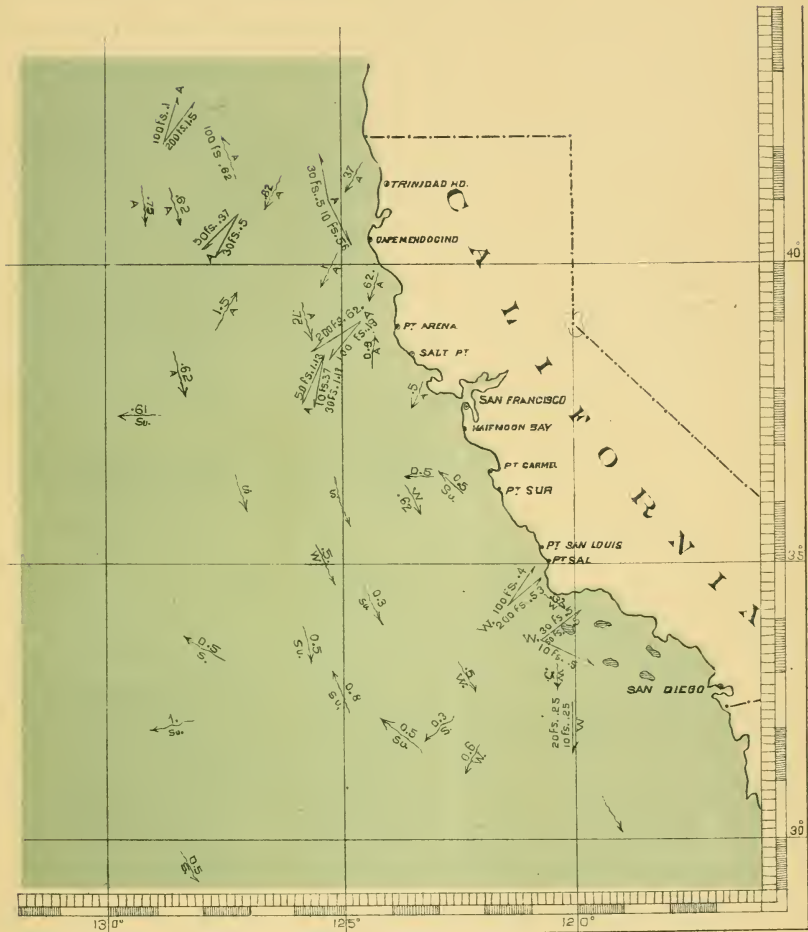


Profile F.

Section of the North Pacific Ocean, between San Diego, Cal., and a position 240 miles West from it, showing Isothermal Lines.



*Current Chart
of the North Pacific Ocean, off
the Coast of California.*



Lith. Britton & Rey, S. F.

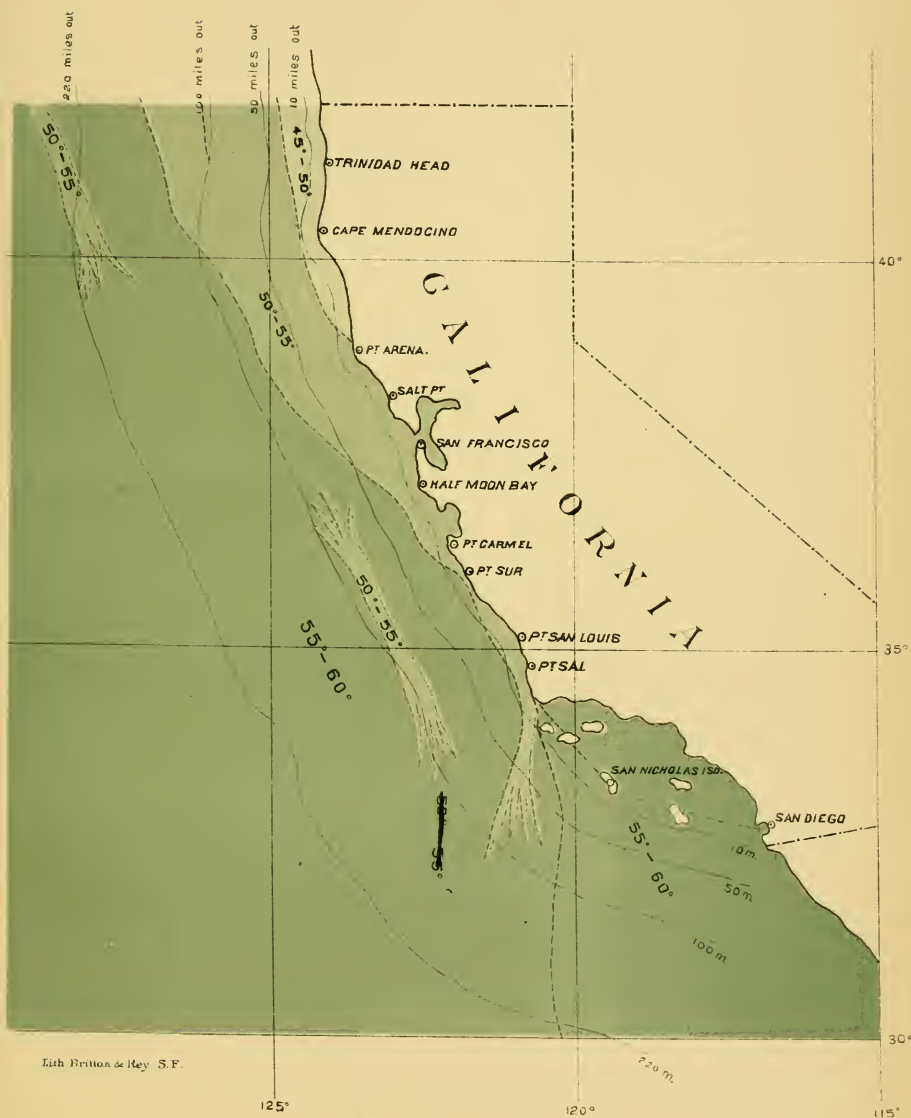
NOTE.

The straight arrows, barbed on one side, represent the Under Surface Currents, and point in the direction toward which they set. The figures represent the different depths in fathoms at which the currents were observed, and their rates per hour in nautical miles or fractions thereof.

The crooked arrows represent the Surface Currents, and point in the direction toward which they set. The figures represent their rates per hour in nautical miles or fractions thereof.

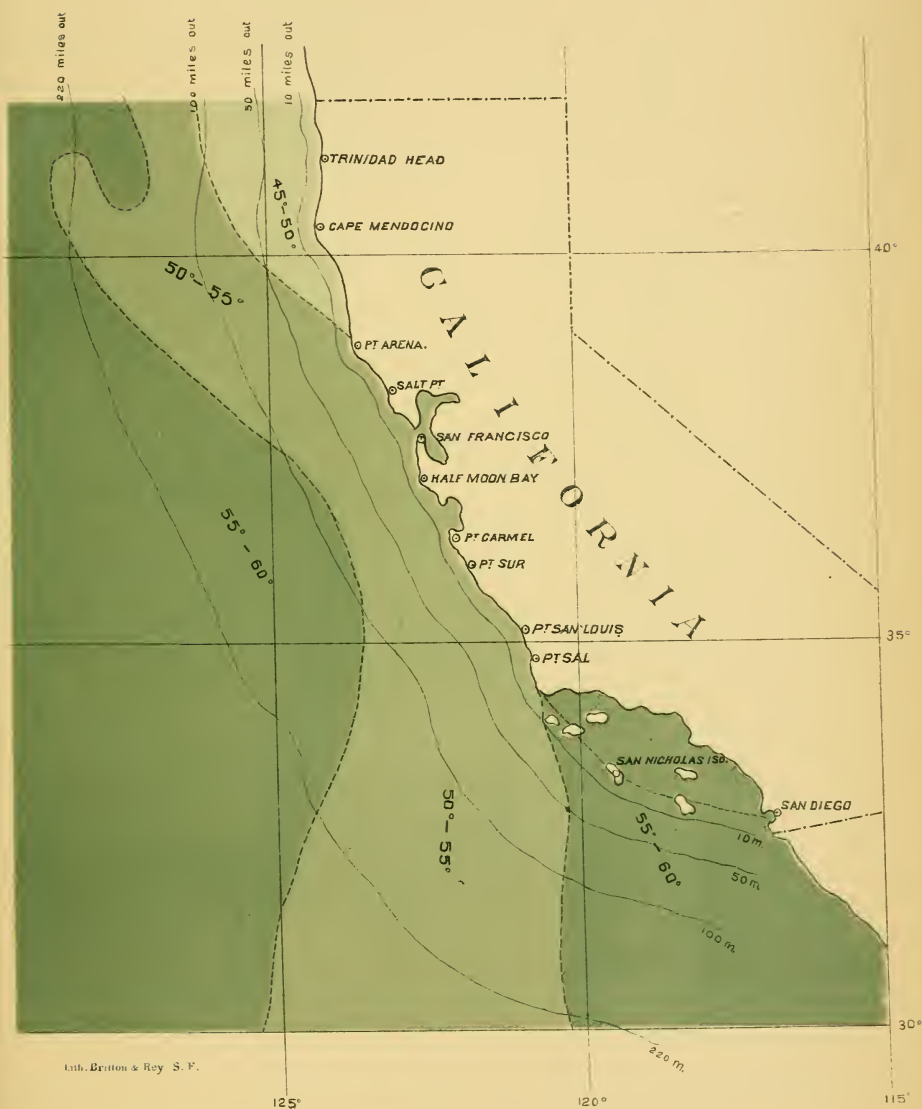
The letters refer to the season of the year in which the observation was made. S.—Spring. Su.—Summer. A.—Autumn. W.—Winter.

*Section
of the North Pacific Ocean,
showing Surface Temperature
off the Coast of California.*





*Section
of the North Pacific Ocean,
showing temperature 10 fathoms below surface,
off the Coast of California.*





1



2



3



4



5



6



7



8



9



10





